THE
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Fuel Rationing Considerations

How the Order May Be Improved

IT was manifestly unfair that coal users should be restricted to 75 per cent. of their normal consumption when electricity and gas rations were restored to the previous year's level. Nobody was surprised, therefore, at the decision of the Secretary for Mines to put coal on a level with electricity and gas. There was, no doubt, some justification for instituting a rationing scheme immediately upon the outbreak of war and there may, of course, be equally good reasons later on for reverting to the provisions of the Fuel and Lighting Order. At present the coal position is satisfactory but the organisation set up to administer the Order is to be retained.

We may suggest, however, that an elaborate administrative system is hardly necessary. Surely electricity and gas supply authorities could be left to watch their consumers' meters, warn them where necessary, and in cases of excessive consumption report to the local fuel overseers. The natural rise in prices will act very effectively as a brake upon the use of more than is strictly necessary in the vast majority of homes.

Are Forms Necessary?

In these circumstances it appears to us that the issue of forms to consumers setting forth the amounts they are entitled to should not be proceeded with. There are already too many forms about and any opportunity of limiting their number should be seized upon.

If it is proposed to issue the Order in a revised form there are several matters which should be considered, apart from the actual rationing figures. For instance, the basic quantity of 1,000 kWh a year where electricity provides the only means of cooking may continue to be regarded as the allowance for a new consumer. The figure is far too small. Taking the rough and ready rule of 1 kWh per day per head, the annual consumption of a family of three for cooking alone will be over that figure, leaving less than nothing for the other services—lighting, heating, water heating, iron, radio, &c.—which will almost invariably be employed in such a house. We suggest that 2,000 kWh would not be too much.

Another thing is the unwarranted distinction between slot meter consumers and others. This should certainly be abolished for it includes the iniquitious ruling that while *all* gas slot meters are exempt, electricity meters only escape when they are used for supplying energy at the lighting flat rate.

There is still a lurking feeling that changing over from coal to electricity is officially frowned upon. We have emphasised that this is not the case although perhaps it is not encouraged as, in the interests of true economy, it might be. Mr. Geoffrey Lloyd stated quite plainly in the House of Commons a few weeks ago that the "Fuel and Lighting Order contained provisions whereby a householder might, if he so desired, change either partially or wholly from one kind of fuel to another." This may be inferred from a reading of two articles of the Order (11 and 12) but after all it is only an inference. What is needed is a plain statement that this is so, together with a table of equivalents.

Consulting Those Concerned

We have already shown that based upon the somewhat arbitrary equivalents already given in the Order (merely for calculating consumption in terms of coal for the purpose of deciding whether premises are to be "controlled" or not) electricity is logically entitled to more consideration. But these arbitrary equivalents are themselves by no means favourable to electricity and we think that something better could be provided by E.D.A.

This leads us to our final suggestion. In our leading article of October 20th we expressed a doubt whether electricity supply interests had been consulted before the Order was framed and later we discovered that the I.M.E.A. had certainly not been approached. Last week, however, Mr. Geoffrey Lloyd said that he had consulted the Coal Merchants' Federation, the Co-operative Societies, the National Gas Council and the Electricity Commission. With all possible respect to the Commissioners we suggest that there are bodies in the electrical industry in much closer touch with the consumers (although we have no exact equivalent of the Gas Council) who might have been asked for their views. Now, however, there is a joint gas and electricity committee which should see that both industries' interests are properly considered.

When all this is done we can look forward to an equitable rationing scheme—something which nobody could object to—if and when it is found that rationing is essential.

Indirect Bulk Supplies

UNDERTAKINGS giving bulk supplies under contracts made since the passing of the 1926 Act must pass on the grid terms to undertakings receiving the supplies. In view of difficulties in interpreting this provision, the Electricity Commissioners have done well to summarise their decisions in their latest annual Report (reviewed in this issue). Broadly, the undertaking giving the supply gets as its sole perquisite the benefit of diversity in the kW charges it pays to the Central Electricity Board—a benefit that would appear to be transferred to the receiving undertaking when apportioning the costs of the transmission line. The difficulty introduced by the incremental charge in assessing the demand payment has been solved in a practical manner by taking the average figure paid by the giving authority. The alternative of ascertaining the fixed kW charge as if the receiving authority were supplied directly from the grid would appear to be impermissible under the Act. Undertakings supplied in bulk from a three-shift selected station are in a better position than those supplied from undertakings which do not own base-load stations. The decisions referred to relate, of course, to individual circumstances, but they should be good enough as a guide in most cases to the general principles upon which such contracts should be based without calling upon the Commissioners for a formal determination of the price.

The Electricity Commission

WE are not sure that we like the implications involved in the retention of the post of Chairman of the Electricity Commission by Sir Cyril Hurcomb who has become Director-General of the Ministry of Shipping. We should have considered the latter appointment a whole-time job in the present circumstances and in this case it would seem that the chairmanship of the Electricity Commission is now a sinecure. No doubt we cannot hope that the progress of the supply industry will continue at the same rate during the war but we cannot believe that it will slow down to a point at which the Electricity Commission becomes unnecessary "for the duration." There is, indeed, every reason for keeping the Commission up to strength to safeguard the industry's position unless, indeed, we are to regard it as just a branch of the Civil Service concerned merely with regulations.

As Normal as Possible

VERY regrettably, many people in this country have imagined that the best way to help to win the war is to shut down all normal activities. We do not believe for a moment that "Business as usual" can be much more than an empty phrase, but to bring the country's ordinary life to a complete standstill is no way of helping the cause. Therefore we commend those electricity supply undertakings who have decided to carry on as far as they can with their development work among consumers, including the continuance of hire and hire-purchase schemes. While stocks of appliances are available and while the production of apparatus can be continued (even if on a restricted scale) there must be outlets for them and these outlets, as in the past, must be largely provided by the supply authorities. We hope that those who hurriedly discontinued their schemes will give the matter serious reconsideration now that normal consumption of electricity and other fuels is to be permitted.

Sub-supplies

A CORRESPONDENT asks us whether it is permissible for the owner of a private estate to purchase electricity from an authorised undertaking and to redistribute it over his own lines to cottages. There is nothing in law to prevent this, but points to remember are that all overhead lines must be constructed in accordance with regulations of the Electricity Commissioners and that any lines passing over streets have, in some areas, to comply with by-laws made by the local authority for the prevention of danger or of obstruction. It is assumed, of course, that the supply of electricity is not the primary business of the estate owner, as if it were he would be debarred from competing with the authorised undertaking from which he receives the bulk supply. That issue is a relatively simple one, and the practice has enabled many country people to enjoy the use of electricity who would not otherwise have done so. Our correspondent goes further, however, in a second question as to whether the landowner is entitled to charge the tenants of the cottages at a higher rate per kWh than that at which the bulk supply is given. Here, again, there would appear to be nothing to stop him from doing so, and his proposal, in so far as it represents a simple means of repaying the cost of providing the retail supplies, would seem not unreasonable. The objection to the surcharge is that it might be imposed in such a way as to restrict development, sound tariff-making not being so simple a job as it sometimes seems to be to the uninitiated.

Business with Canada

THE views expressed by Mr. A. R. Bruce in his report to the Department of Overseas Trade, which we deal with on another page, confirm those put forward by Mr. C. G. Abbey in writing in our April 7th issue. United States influence in Canadian affairs is naturally very strong, and it extends into the electrical field in a number of ways, notably in the matter of standardisation. British manufacturers may think that the Dominions should adopt British standards, but other than Imperial considerations enter into this. Associates in Canada of American concerns have been strong enough to impose American standards on the Canadian market, and unless British manufacturers pay due regard to this they will find it difficult to sell their products. Another matter stressed by both writers is that of service. Unless British producers are able to set up, individually or collectively, organisations capable of looking after their equipment after it is sold they are likely to do themselves and British trade generally much harm. And it must be remembered that it is not easy to cover the whole of the Dominion from one centre.

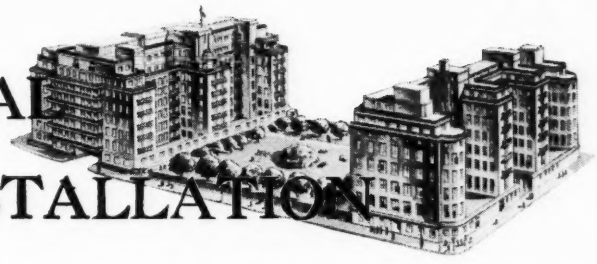
Trolley-bus Practice

IT is impossible to consider the use of trolley-buses apart from economics, as Mr. G. F. Sinclair stated in his I.E.E. paper which was published at the end of last week. Economics should, of course, be given its widest meaning. That is to say, it is not merely a matter of comparing working costs and capital charges for various kinds of vehicle, but also of the value attached to the service by passengers who provide the revenue. Costs per mile must, however, be regarded as providing a preliminary criterion; from this point of view, as Mr. J. H. Parker showed in our columns last January, the trolley-bus is just as capable of holding its own (given ordinary urban traffic densities and reasonable prices of electricity) as it is in competing for the favour of the public. Not that there have not been snags to overcome and many debatable points to be cleared up. Mr. Sinclair shows what understanding of the engineering problems involved went to building up the success achieved by the London Passenger Transport Board—problems that ranged from mechanical construction (the experimental chassis-less bus is a promising development) to such apparently small points as radio interference suppression and low-voltage lighting.

Helpers Wanted

IN these days it is better to have something to occupy one's spare time; national service is thus beneficial both to the nation and to the individual concerned. Those electrical men who are not engaged in any form of national service could render a great deal of assistance to their fellows in the industry by joining the band of workers for the Electrical Industries Benevolent Association. Offers of help will be gladly received by the Secretary at 6, Southampton Place, W.C.1, or by any of the honorary branch secretaries.

HOSPITAL INSTALLATION



London's Most Modern Medical Centre

By R. F. Twentyman*

THE imposing new Westminster Hospital in Horseferry Road replaces the original building, which had stood since 1834 opposite Westminster Abbey and was the first purely voluntary hospital to be founded in this country.

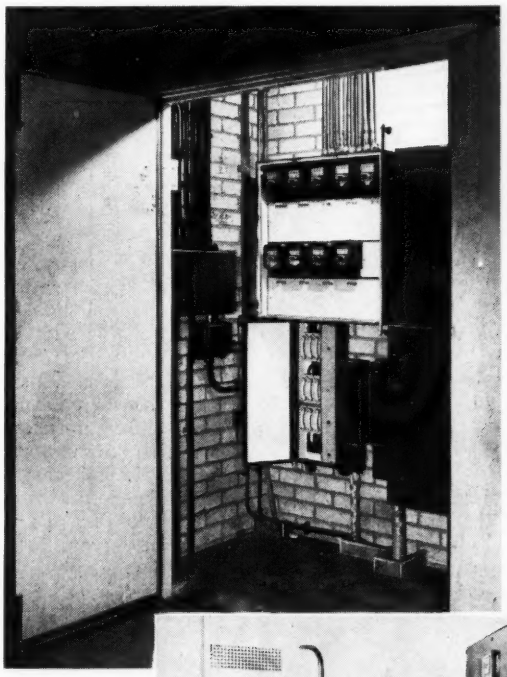
Apart from the Medical School and Nurses' Home the hospital block is 300 ft. long and 100 ft. wide across the wings. Two of its ten floors are below ground level and to avoid traffic congestion a one-way road through the centre of the building forms the main entrance, with the hospital built on each side, over and beneath it. There is a pavement on one side only, off which are the entrances to the various departments, rendering it unnecessary to cross the covered roadway.

Special protection against gas attack has been provided and specially strengthened roof and three top floors will reduce risk of damage by aerial bombardment. Subsidiary theatres are provided on lower floors so that in an emergency the top sections of the building can be evacuated and the main functions of the hospital carried on lower down. A natural air-raid shelter is provided by a tunnel, 100 yards long, constructed of reinforced concrete 20 ft. below ground level, connecting the Hospital with the Nurses' Home.

Other innovations are the grouping of departments dealing with various allied diseases, whereby segregation and the conventional out-patients' common waiting hall are dispensed with. In effect, each ward unit comprises consulting and treatment rooms with an adjacent waiting hall for out-patients and almoner's and record offices. Each unit also includes wards for male and female in-patients, with the usual duty room, sluice room, kitchen and two bathrooms.

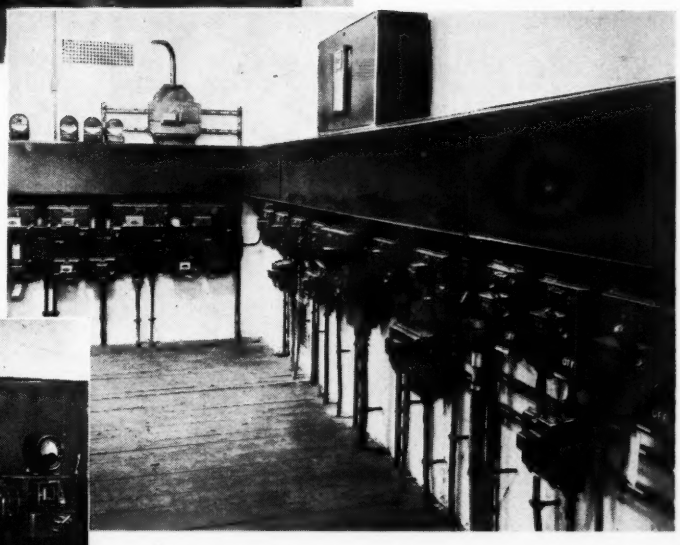
Further saving of time is assured by a Lamson tube installation connecting each floor to the dispensary on the ground floor, for conveying patients' medical prescriptions. An extensive manufacturing laboratory is provided with power plant for the preparation of medicines on the premises.

A complete children's hospital occupies the south section of the second floor, together with a separately ventilated babies' ward. A ceiling suspended "Scandinavian" type inspection lamp is provided for each cot in place of the standardised bracket provided for all other beds. The whole of the sixth floor is for private paying patients, mostly in separate bedrooms. This forms an independent unit with a large reception lounge, smoking room and solarium, with separate lift and entrance on the ground floor.

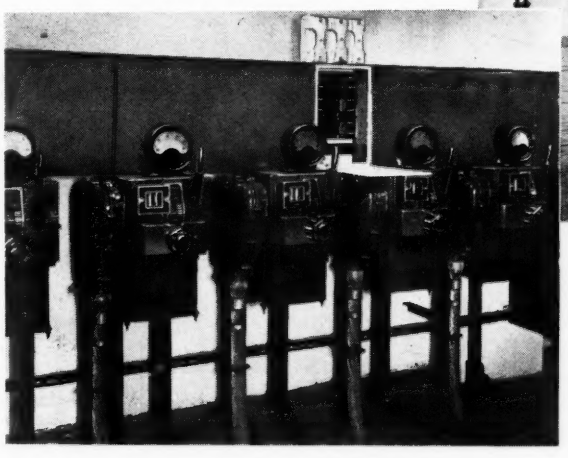


Foot of one of the rising ducts, main distribution board, check Wh meters, rising cables and local lighting distribution board (left)

The total bed accommodation is for 406 in-patients and after the main part of the engineering services had been planned, due regard had to be had for suggestions offered by the nursing and medical staffs and the Hospital Building Committee, which visited various hospitals in different parts of the



Part of switch room showing power board with Diesel emergency board in background

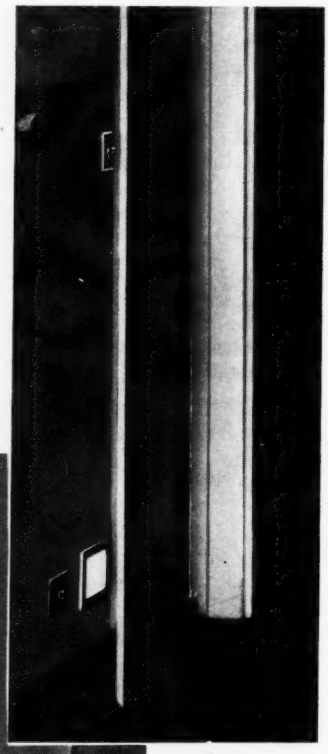


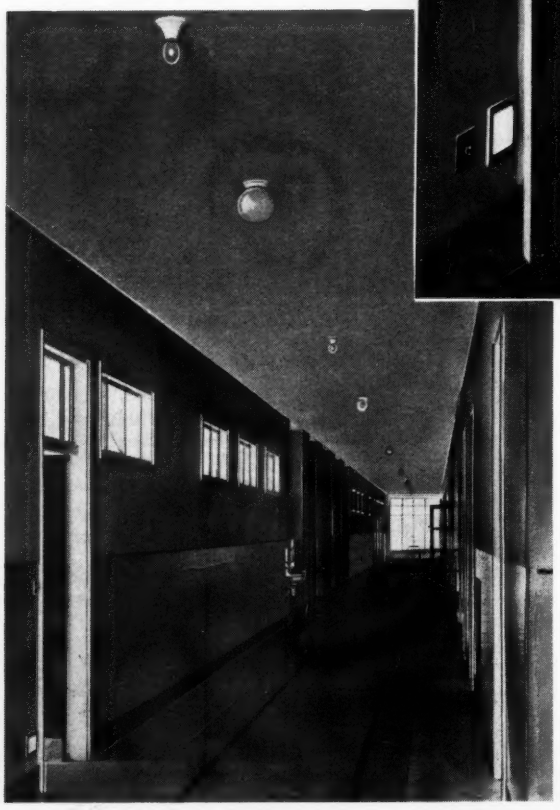
Below: Main switchboard bus-bars showing disconnecting links removed (top) and outgoing circuit-breakers

* Supervising engineer for F. H. Wheeler & Co., Ltd., installation contractors.

world to obtain first-hand knowledge of other countries' modern practice. This accounts for the words "specially designed" appearing so frequently in this description of the installation. The special designs vary from lighting fittings to ordinary local switches, which are all of silent operation, and even switch and switch/socket plates are of moulded "Roanoid" in mottled onyx finish.

The architects, Messrs. Adams, Holden & Pearson, and the consulting engineers, Messrs. Albion T. Snell and Partners, departed in many respects from conventional design. But, contrary to what was intended, only four distribution ducts could be constructed. This in itself necessitated long circuit wires, but it was also found impossible to build the ducts to the dimensions asked for. Planning the equipment into spaces inadequate for the purpose was further complicated by the floor construction. The building is steel framed with concrete cased floor girders; for sound-proofing between floors, a hollow tile ceiling is constructed flush with the underside of the girders, while timber flooring is laid direct on the top of the girder casings. This left a cavity for all conduits and other engineering service pipes, but necessitated holes in the girders to allow the pipe systems to pass through. The contractors had to indicate where holes were required before erection, as, for reasons of economy, all were drilled in the girders at the fabrication works.





Main corridor illustrating inset skirting nightlight switched in conjunction with ceiling globe, alternating with emergency lamps

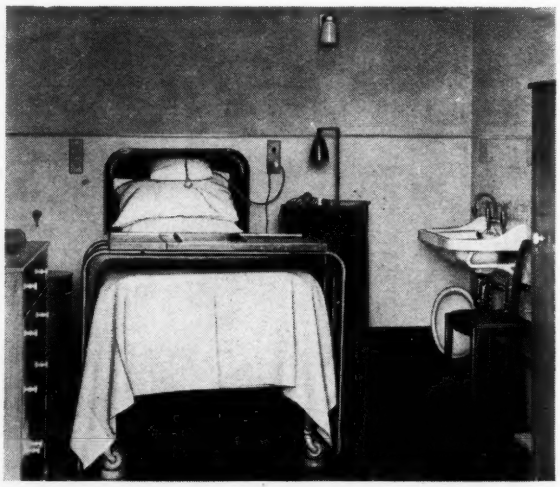
To avoid weakening the girders the holes could not be located indiscriminately. This, together with the need to adhere to fixed positions for floor draw-boxes occasioned very extravagant runs of conduit. Thirteen separate and individual conduit systems have been installed. One of three separate 230/400-V 3-phase AC services from the mains of Central London Electricity, Ltd., terminates in cut-outs for the kitchen cooking load. The remaining two pass through duplicated 500-A t.p. and n. circuit-breakers and armoured cables to the main switch room, terminating in isolating switches connected to main bus-bars, which are arranged in two sections with detachable links in the phase bars. These links are only inserted in an emergency to enable a restricted service to be maintained should one of the supply authority's main circuit-breakers trip out due to overload or any other reason—a provision of importance to a hospital.

Three 300-A and two 200-A t.p. and neutral main outgoing circuit-breakers are connected to the main bus-bars, each controlling the individual switchboards for the five sections into which the installation has been divided, *i.e.*, lighting, power, heating sockets, lifts and X-ray equipment.

The main gear on the lighting and heating sockets boards includes four 100-A t.p. and n. circuit-breakers and four 150-A t.p. and n. switch/fuses respectively, from each of which p.i.l.c. armoured cables go in a specially constructed duct in the basement floor to the foot of four vertical service ducts where the sub-main distribution boards are situated. Armoured sub-mains then run in the ducts to local distribution boards in cupboards on each floor, with watt-hour meters in circuit with each rising cable at the basement level. The hospital administration particularly asked for the latter to enable records to be kept of the consumption of the various departments throughout the building.

On the switchboard for the Waygood Otis lifts four outgoing switch-fuses control cables feeding the apparatus in the lift motor rooms, three of which are on the roof level, and one in the basement. Three cables terminate in circuit-breakers mounted on the lift controller panels, while the remaining cable in the centre roof lift motor room is connected, through an isolating switch, to a separate local switchboard equipped with circuit-breakers for the three lifts controlled from this position.

The power switchboard permits a number of essential services to be transferred through a change-over switch to the emergency Diesel supply board in the event of a complete mains failure. A total of ten switch-fuses controlling local power distribution boards throughout the building are mounted on this particular board, varying from 15 to 150 A.



Private patient's room with bedside switch-sockets for treatment, wireless and bell, with adjustable reading lamp fixed to locker

Nine outgoing switch-fuses serve the X-ray equipment, which was described in our last issue. The power, lifts and X-ray switchboards each includes a watt-hour meter to record total consumptions of individual services. A total of 83 meters is provided, apart from the usual meters of the supply authority.

The decision that a conventional lighting bracket should be provided for each bed called for an easily cleaned fitting to provide ample light for a patient when sitting up while avoiding glare when lying down, and also without glare discomfort to the patient in the corresponding bed on the opposite side of the ward. Lampshades of moulded material have been used in preference to glass, and metalwork is finished in stoved white enamel. The illumination of the private patients' single bedrooms has been dealt with in a different manner. In most cases a two-lamp bracket provides light for both bed and wash basin. The main lamp is controlled from the bedside switch assembly, but a 15-W pilot lamp is housed in the bracket arm, to shine through an obscured glass panel underneath. The pilot lamp only is switched from the door; this arrangement enables a nurse to enter the room at night without awakening a sleeping patient. A small adjustable shutter is fixed beside the pilot lamp so that the light may be shielded from the patient's face. The main object of the bracket fitting is to provide general, rather than local lighting, each room having, as standard equipment, an adjustable reading lamp fixed to the bedside locker.

Main operating theatre showing shadowless ceiling lighting and three X-ray viewing boxes with dimmer control built in wall

The main corridor windows "borrow" natural light from the wards in daytime. These admit excessive illumination from the corridor ceiling lamps to the wards at night. Therefore specially designed flush boxes, with downward sloping louvres, are inset at skirting level to correspond with each ceiling point. Both points are controlled by a "two-way and off" switch, an economical arrangement, as both cannot be in circuit simultaneously.

Operating Theatre Lighting

There are eight operating theatres; two of the four largest on the top floor have reconditioned "shadowless" fittings removed from the old hospital. For general illumination each has, in addition, four specially designed obscured glass bowl fittings fixed close to the ceiling, behind which are polished aluminium reflectors on adjustable brackets, housed in the ceiling space. Each has a 200-W lamp with the main beam concentrated to the centre of the theatre floor to supplement the shadowless lighting on the operating table.

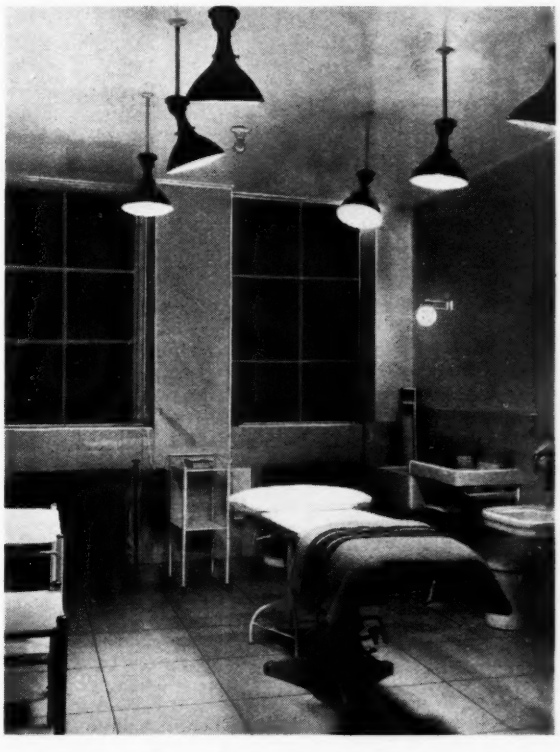
A departure from convention is evident in the two main theatres. To obviate the danger of dust from a ceiling-suspended fitting falling on to a patient while undergoing a surgical operation and to reduce the discomfort caused to the surgeon by concentrated heat from lamps directed on to his head and neck, fourteen Holophane flush laylights in the ceiling direct shadowless light on the operating table. The enclosing metal case contains a prismatic glass plate fixed at a predetermined angle between a prismatic glass concentrating reflector and a plain glass front plate fixed flush with the ceiling. The fittings are mounted in a false ceiling which provides ventilation to disperse the heat of the 150-W lamps employed; 150 ft.-candles is obtained over the whole area of the table compared with 100 ft.-candles over a radius of 24 in. in the case of the shadowless fittings formerly used by the hospital. Two smaller flush fittings provide pilot lighting from the 10-V independent emergency battery circuit.

The remaining theatres are each equipped with six Holophane prismatic reflectors with adjustable galleries, tube-suspended from the ceiling, and provided with 150-W lamps.

Instead of portable X-ray viewing boxes there are permanent built-in flush fitting wall panels illuminated with four lamps behind reflectors with a front panel of flashed white opal glass and a chromium-plated metal frame. A top rail with clips for suspending the films is supplied, and radial switch type dimmers ensure a smooth variation from full light to "black-out." One viewing box is fixed in each ward while three separate boxes in one framework are provided in each of the main operating theatres.

Electrical Treatment

For the use of electricity for medical treatment every bed has an adjacent 5-A switch-socket, to ensure non-interchangeability with low voltage apparatus and bell plugs, which are all of 2-A gauge. Two 15-A switch-sockets are provided in each ward, one in each private

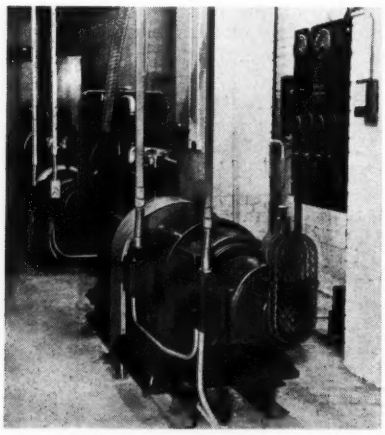


Casualty operating theatre showing form of lighting employed in other than main theatres

patient's bedroom, and one or more in each consulting room, the number varying according to the treatment for which the room has been specially designed. In each ward kitchen the power socket has an added pilot lamp. This is a provision for future use of electrically heated food trolleys.

An innovation is the circuit arrangement for a wall-type heater in the special lift serving the operating theatres. Socket outlets in the main operating theatres are all of mercury-tube sparkless type (as are the lighting switches) mounted collectively in a large metal box with a special moulded "Roanoid" front panel on which the units are flush mounted. The equipment on each of these "posts" comprises four 5-A switch-sockets (two fed from the mains supply, one from the 100-V battery and one, with pilot light, from the Diesel emergency supply), together with two power switch-sockets of 15 and 30 A. For the use of portable X-ray apparatus four specially designed 30-A switch-sockets incorporating double-pole fuses have been provided on each floor and similarly in the main operating theatres.

In the spacious gymnasium is incorporated the Physiotherapy Department in which 30 power sockets have been installed. Many of the items of Cox Cavendish electro-medical equipment are of new and special design, the apparatus including three combined treatment tables for galvanism, ionisation, faradism and sinusoidal current. Infra-red heat treatment is provided by five-element apparatus, two tunnel baths, a "Sollux" lamp with non-luminous generator, and a small lamp for local application. Electronic-discharge-tube type ultra-violet light equipment includes a quartz-mercury-vapour lamp and two wall pattern high-pressure single-arc tube "Alpine Sun" lamps. A special circuit has also been provided for the 35-A automatic flame arc lamp, which has a specially designed control panel and is supplied through a 230/100-V transformer. There is also a number of electrically heated paraffin wax baths.



Two Kohler 37.5-KVA emergency generating sets with AC voltage regulators

Two beds only (permanently screened for serious cases) in each public ward are provided with bell points, since the nursing staff numbers 240 compared with approximately 400 patients. Standard equipment comprises a wall socket, white t.r.s. flexible cable and white rubber bell push. At each night nurse's station there is a floor socket, extension cord and table bell push. Mechanical replacement "drop" type indicators, incorporating a bell and mounted flush in the wall, are outside each duty room for calls from the adjacent wards and bathrooms. Each indicator has, adjacent wards and bathrooms.

For the bathrooms a specially adapted ceiling switch to serve as a bell "pull" has been standardised, the cord hanging over the edge of the bath within easy reach. Private patients have luminous bell equipment, bedside units comprising a pilot light, relay reset push and socket for extension cord and pressel push; indicators have pilot lights.

Pilot lights outside doors and in corridors (a total of 121) make it unnecessary to examine the duty room indicator to ascertain the origin of any call, unless a local pilot lamp should fail. The pilot lamp in the bedside unit indicates to the patient that a call has been registered, while the answering nurse must, of necessity, actually visit the patient as the call can only be cancelled from the bedside reset push. In each consulting room a bell push on the doctor's table actuates a specially designed flush fixing unit in the patients' waiting hall outside, comprising a buzzer and illuminated sign worded "Next Patient Please."

The bell circuits are divided into 32 separate installations, each with a 230/24-V transformer fed from the local lighting distribution board. A number of other transformer-fed circuits at 12 V with two-pin wall sockets are used for testing and treatment instruments at each bed in the ophthalmic wards and operating theatre and consulting room, and in the ear, nose and throat unit.

The wireless receiver for reproduction from home stations only is rack built, the framework being mounted on a wheeled platform which, for ease of maintenance, enables the receiver to be removed from its cupboard. The mains feed and outgoing circuits are connected through non-interchangeable wall sockets, with separate channels for headphones and loudspeakers and each bed throughout the hospital has a wall jack for headphones. Three loudspeakers, each with adjacent volume control, are fixed in the children's wards, with a fourth in the private patients' solarium. A microphone circuit from the hospital chapel enables religious services to be relayed to patients.

There are three individual telephone services, the most extensive being the automatic intercommunication system (Reliance Telephones, Ltd.) Fourteen instruments are provided in the administration offices, one in each almoner's office and one in the duty room attached to each ward unit, the whole system being designed to cover every department in the building. A further local (battery operated) system of eight instruments provides private intercommunication between the radiographic rooms, dark rooms and X-ray administration offices.

The wiring for the G.P.O. and all other 'phone services is enclosed in steel conduit throughout. On each floor, for the use of visitors, there is a public call box and a private call box for the use of the hospital staff. Each of the private patients' bedrooms has a wall jack for an instrument if required.

Kitchen Equipment

Electricity is not employed to any extent in the main kitchen, except for a fish fryer (7½ kW) and one roasting oven (16 kW). Power is used for two refrigerated cold rooms, separate refrigerators for fish, milk, bread and special diet ingredients; also for potato peeling, pastry mixing and for sundry other purposes.

A master controlled-impulse clock system has slave dials in each ward, almoner's office, consulting room, main stair landing and in various administration offices. Synchronous mains-operated clocks, with seconds hands, are provided in the main operating theatres.

Emergency Plant

The two emergency generating sets are each of 37½ kVA at 230/400 V, 3 phase, 50 cycles, the same as the supply mains, thus avoiding the duplication of motors. To each 46-HP 4-cylinder Kohler-Perkins Diesel engine, operating at 1,500 RPM, is directly coupled a 105-V alternator with a 1-kW exciter overhung and a belt driven voltage regulator, the whole mounted on a single bedplate supported on six "Silentbloc" fittings. Flexible exhaust pipes, electric conduits and other connections prevent the transmission of vibration and noise.

One set is primarily for lighting purposes and is automatically started by a relay (which is normally held out of circuit through a permanent connection to the supply mains) completing the circuit to a 24-V battery. Further automatic features prevent the exhaustion of the battery should the engine fail to start. Full pressure is generated, under load, within eight seconds of an interruption of the mains supply.

Thus entirely independent emergency lighting is provided by 192 pilot points in all operating theatres, main corridors, wards, consulting rooms, surgeries, the

covered roadway and other important positions. A local distribution board with an isolating switch is on each floor, but local switches have been eliminated, thus ensuring that the whole installation is always in circuit ready for service. Local change-over switches are fixed near the main operating theatres so that only at these positions is the emergency installation in any way interconnected with the mains supply circuits.

The second plant provides for the continuation of essential power services and is started by push-button. In this case power circuits have to be manually changed over, including the passenger lifts (micro motors only), plenum plant, calorifiers, roadway extract fan, sewage pumps, main water tank booster pump and battery charging panels for the 100-V operating theatre circuits, fire alarms and Diesel engine starting motors.

There is a separate switchboard for the emergency installation in the main switchroom, all outgoing services from which are controlled by change-over switch-fuses. This enables any particular load to be fed from either generating set, and also facilitates connecting restricted lighting and power circuits to one plant only in the event of the other being out of commission through routine overhaul. An additional emergency 100-V 60-Ah battery provides 26 pilot lighting points to the operating theatres and casualty surgeries, and, in the event of local fuse failure, is sufficient to enable the medical staff to continue operations until normal lighting can be restored.

The Nurses' Home and Medical School, under one roof but separated from the hospital block by St. John's Gardens, includes facilities for research work; one of the lecture theatres will seat 250 students and is equipped with a cinematograph projector.

The total cost of the complete building scheme amounted to £850,000, and the electrical installations, excluding the lifts, X-ray plant, and portable apparatus, accounted for approximately £40,000 of this total. There are 4,400 lighting points, 4,070 local switches, 1,150 lighting sockets, 405 power sockets, 186 local distribution boards, 101 electric motors (varying from 0.25 to 13 HP), 163 electric clocks, 160 internal and 118 G.P.O. telephones, 85 fire alarm bells and pushes. Materials installed included 261,000 yd. of v.i.r. cables (varying from 3/.029 to 37/.083), 4,950 yd. of p.i.l.c. armoured cables (varying from 0.0045 sq. in. twin to 0.5 sq. in. 4-core), and 33,600 yd. of bell wires.

The whole of the electrical installation contract was carried out by F. H. Wheeler & Co., Ltd., the subcontractors and suppliers including the following:—

Kohler Co., Ltd., Diesel generating plants; Holophane, Ltd., special lighting fittings for operating theatres, &c., also bulkhead fittings; G. H. Turner & Co., lighting fittings; W. T. Glover & Co., Ltd., armoured non-bleeding and v.i.r. cables; J. G. Statter & Co., Ltd., circuit-breakers; Dorman & Smith, Ltd., distribution boards and isolating switches; L. Weekes & Co. (Luton), Ltd., switch-fuses; Mantel Metalworkers, Ltd., busbar chambers and trunking; Gent & Co., Ltd., bell and fire alarm equipment; Smith's English Clocks, Ltd., impulse and synchronous clocks; H. J. Leak & Co., wireless receivers and amplifiers; Wandsworth Elec. Mfg. Co., Ltd., switches; A. P. Lundberg & Co., Ltd., switches; Roanoid, Ltd., switch and switch-socket plates; M.K. Electric, Ltd., switch-sockets; Walsall Conduits, Ltd., mercury sparkless switches and switch-sockets and conduit fittings; Venner Time Switches, Ltd., time switches; Curtis Manufacturing Co., Ltd., dimmers; General Electric Co., Ltd., watt-hour meters; Bull motors (supplied through J. Jeffreys & Co., Ltd., for heating and ventilating plant); Electrical Apparatus Co., Ltd., motor starters; J. H. Tucker & Co., Ltd., shuttered sockets; Crompton, Parkinson, Ltd., alternators; I.A.C. (Isenthal Automatic Controls), Ltd., voltage regulators; Chloride Electrical Storage Co., Ltd., operating theatre and fire alarm batteries.

REORGANISATION OF SUPPLY

Three Outstanding Problems

WHAT has been the outcome of legislative activities that followed the exposure of weaknesses during the 1914-18 war? An attempt to answer this question is made by Mr. F. W. Purse (chief engineer, London and Home Counties Joint Electricity Authority) in the first part of the inaugural address he has prepared as chairman of the Transmission Section of the Institution of Electrical Engineers.

Coal conservation was the hare which started the legislative hounds on the track, but the electricity course is the only one on which the chase has been assiduously pursued. Has that basic principle been fulfilled? If coal has been conserved, has the cost of the achievement, including the loss to the mining industry, been justified? The "man in the street" who pays says "No," according to Mr. Purse.

Mr. F. W. Purse

The major object of the Electricity (Supply) Act, 1926, was not to reduce costs, but a desperate anxiety to prevent costs increasing; yet the Electricity Commissioners are not to permit the Chester Corporation to extend its generating facilities though it would be demonstrably advantageous.

In Mr. Purse's opinion uniformity of control can never be achieved so long as a public service is saddled with two dissimilar types of ownership with differing outlooks. Again, local authorities' rights of purchase of company-owned distributing undertakings is a subject that bristles with a variety of problems, and failure adequately to deal with it is considered by Mr. Purse to be a serious reflection on those who took in hand the job of reorganising the industry.

Next, there is rural electrification which will undoubtedly continue to be urged as a moral liability irrespective of the financial consequences. Despite ingenuity and endeavour the results have not been encouraging; progress must necessarily be slow and the price of electricity is not alone the determining factor. Mr. Purse's conclusion, therefore, is that if rural electrification is to be still more intensively developed it can only be done by a subsidy from somebody. Who this somebody is to be he does not prophesy, but the great tracts of electrically undeveloped rural areas are not generally associated with large industrial centres which would be best able to carry the subsidy.

These are the three outstanding matters which Mr. Purse considers require deep and serious consideration if Parliament does in due time consider further legislation is imperative. He advocates that these and other matters of like importance should be tabled in order of merit and carefully examined without delay by an expert body able to put forward constructive and acceptable proposals so that they may go forward immediately the appropriate time has been decided upon.

Whatever may be the position and condition of our industry when the wished-for "peace" is declared, he has no doubt that the nation will, whether with a clearly defined criticism or not, press for the reorganisation of the supply industry, and, as the House of Commons is the voice of the nation, it will be difficult to resist the public demand. The supply industry should itself, therefore, get on with the job vigorously and drop all the internal quarrels of the past so as to avoid the danger of antagonism becoming more acute and closer to flashpoint, resulting in Parliament hurriedly stepping in and, as in the past, imposing a settlement satisfactory to itself but unsatisfactory to those mainly concerned.

Regarding the technical side, the war will be a testing time for all the work and plans which have been carried out, and many questions that spring to mind can only be answered when the struggle is over. The eagerness of the Transmission Section to do its part should not be stultified by restrictions on the financial side, and the charges for supply should not be depressed to such a degree as to necessitate transmission and distribution systems being cramped to an extent which one might rightly regard as "penny wise, pound foolish." Mr. Purse says that he has always contended that electricity is a good service and well worth a fair price, and yet it seems to have been singled out in distinction to all other commodities and services as the subject of attack from every quarter with incessant demand for cheaper and still cheaper rates. This attack is evidence, of course, that the public wants electricity in preference to its rivals and hopes to have all the advantages which electricity offers without paying for them. Mr. Purse feels that, goaded on by a selfish public, they have competed too much among themselves in reducing charges and that this has prevented them from making the necessary financial provision for a rainy day.

ELECTRICITY SUPPLY PROGRESS

The Commissioners' Annual Report

THERE was a falling off in the rate of increase of output of public generating stations in 1938-9—8.3 per cent. compared with the 11.9 per cent. attained in the previous twelve months. Nevertheless, the slowing down was evidently regarded as temporary only, since the Nineteenth Annual Report of the Electricity Commissioners (Stationery Office, 2s. 6d.) records that nearly 920,000 kW of new power station plant was sanctioned, including 150,000 kW for the initial sections of two new stations, bringing the total for the last three years to over 2½ million kW.

Much attention was devoted to civil defence in consultation with the A.R.P. Department of the Home Office after the position had been reviewed by a national committee of the electricity supply industry appointed early in 1937. This committee and other electrical associations also co-operated in drawing up the scheme to ensure the functioning of essential supplies in wartime that was provided for in the Civil Defence Act. Closely associated with this subject was the Report on Fire Risks at Generating Stations issued during the year.

At the beginning of 1939 the Commissioners issued a questionnaire to upwards of 100 undertakings relating to the practicability of bringing their declared AC voltages of less than 230 up to the standard.

Indirect Bulk Supplies

In regard to prices to be charged for bulk supplies given since the passing of the 1926 Act by intermediary undertakings which are themselves supplied in bulk by the Central Electricity Board at the grid tariff, rulings have been given that the maximum demand on which the taker of the indirect bulk supply is charged is that which occurs in any half-hour in the four winter months (not necessarily at the time of the intermediary's own maximum demand), thus giving the intermediary the benefit of any diversity.

Another question concerns the fixed kW charge to be paid by the taker of an indirect bulk supply. This is complicated by the stepped character of the fixed charge under the grid tariff, which provides for lower rates for increments of kW demanded in excess of the initial basic demand. It was decided that the indirect charge should be the average charge per kW paid by the intermediary to the C.E.B.

In one case an intermediary gave a bulk supply to another undertaking from an additional point of supply for which the intermediary paid an annual service charge to the C.E.B. The taker of the indirect bulk supply was required to pay a proportion of the service charge equivalent to its m.d. at any time during the year of account divided by the rated kW capacity of the service installation.

Where a transmission line is used by the intermediary for giving other supplies also, the proportion of the cost of the line to be paid by the taker of the indirect bulk supply is equivalent to its m.d. at any time divided by the sum of all the individual demands, irrespective of the times of their occurrence during the period of account.

Statistics included in the Report show that the number of separate authorised undertakings in Great Britain was 581 at March 31st, of which 373 (including the C.E.B.) were publicly owned. These undertakings operated 370 stations (22 fewer than in the previous year), which in 1938-9 generated 25,284 million kWh. Figures for the calendar year ended December 31st, 1938, show that public authorities owning 207 of the stations produced some 13,000 million kWh from 8,435 tons of fuel, and companies operating 163 stations produced 11,000 million kWh from 5,770 tons. In the fuel totals are included 176,000 tons of coke and breeze and 20,000 tons of fuel oil.

The kWh generated by these stations in 1938 was 6.4 per cent. more than in 1937, but only 1.1 per cent. more coal was used. Steam stations accounted for 95.25 per cent. of the total. The result was that an average of 1,640 kWh was produced per ton of coal, as compared with 1,200 in 1930.

In the nine scheme areas of the C.E.B. there were 137 selected stations (including one belonging to a transport undertaking) which produced 93.6 per cent. of the output, the balance being obtained from 236 non-selected stations; 39 of the latter were controlled by the Board.

Easily the biggest output was in the S.E. England area, 7,207 million kWh, almost equal to the sum of the kWh generated in the two next, the N.W. England and N. Wales and Central England areas. In the first of these areas 276,000 kW of extensions are in hand, and in the other two 122,500 and 174,250 kW.

In addition to the electricity produced by authorised undertakings as above, returns are included for fifteen stations belonging to railways, and six stations belonging to other transport authorities. These, with five stations of non-statutory undertakings (which include waste heat and water power schemes), generated 1,416 million kWh. Of this total the railways were responsible for 947 million kWh using 659,000 tons of fuel, and other transport undertakings for 389 million kWh using 265,000 tons of fuel, giving an average of 1,449 kWh per ton of coal.

Sales by authorised undertakings in 1938 amounted to 20,391 million kWh—an increase of 1,333 million kWh on the figures for 1937—the smallest advance since 1933. The total represents an average consumption of 441 kWh per head of the 1938 population.

At the end of March last the Central Electricity Board was taking supplies from 125 authorised undertakings and one transport undertaking and was giving supplies to 220 undertakings, including 106 which owned selected stations. In many of the remaining cases the whole supplies were taken from the grid. In addition, the C.E.B. gave a direct supply to the Southern Railway.

Consents issued for the establishment or extension of main transmission lines included those for 148 miles of 132-kV and 17 miles of 66-kV lines for the C.E.B. and 58 miles of 66-kV, 120 miles of 33-kV and 24 miles of 25-kV lines for other undertakings.

Publicly owned undertakings were authorised, during the period under review, to borrow £25 million, of which £9.8 million was for plant, £8.1 million for mains and services, £2.8 million for buildings and civil engineering, and £1.2 million for meters and instruments. Surplus revenue amounting to £1,426,000 was allocated to capital account, chiefly on distribution. Sanctions for borrowing for mains, services and control apparatus for street lighting are to be given in future by the Electricity Commissioners, but the Ministry of Health will continue to deal with those relating to street lighting posts and fittings.

Competitive Tenders

It is emphasised that public authority undertakings should obtain open competitive tenders for all capital works unless they have first satisfied the Commissioners that special reasons justify a departure from this practice.

Protective multiple earthing on low-voltage systems is to be permitted, subject to certain conditions. One of these is that no fuse or non-linked switch shall be included in the neutral conductor whether of the undertaking or its consumers, the former bearing the cost of alterations on consumers' premises.

Seven permits were given for the insertion of arc-suppression coils in the earth connections of high-voltage systems. As these coils have now proved satisfactory, six-monthly reports of their operation need no longer be made to the Commissioners.

An appendix gives results of five rural electrification schemes. Dumfriesshire, Kirkcudbright and the West Midlands J.E.A. show surpluses and Bedford and Norwich deficits. Other appendices give particulars of electrical development schemes, loans, alterations in declared voltages and type of current, Acts and Special Fringe Orders, compensation for loss of office and expenses of the Electricity Commission.

The staff of the Commission numbered 142 (91 established) and the amount to be recouped from authorised undertakings on the basis of kWh sold in each case in 1937 was £70,000, which worked out at 0.00089d. per kWh. The costs of frequency standardisation, which is also recovered by the Commissioners, involved a levy of 17s. 5d. per £100 from the sale of electricity other than bulk supplies.

Mining Electrical Apparatus

THE usual quarterly list of mining electrical apparatus for which certificates of flameproof enclosure have been granted has been issued and a limited number are available at 1s. 1½d. each, post free, from the Mines Department, Dean Stanley Street, London, S.W.1. The list covers the three months ended September 30th last and contains brief descriptions of the apparatus certified (eighteen manufacturers), together with industrial gear accepted for provisional tests (nine manufacturers) without the issue of certificates.

CONDITIONED BOILER WATER

Resulting Chemical Problems

By F. Kenyon, A.I.C.

THE ideal in steam generation is to keep the heating surfaces of the boiler clean and free from scale, to have a minimum of corrosion and to generate pure steam. It is relatively simple to avoid boiler scale even when no water purification plant is available, but complications may arise that are almost comparable with those due to the scale, such as excessive blowing down, boiler priming and "carry-over," which lead to superheater-tube failure and maybe damage to the plant utilising the steam. Caustic embrittlement of boiler plate has also to be given consideration when dealing with the internal water conditions of a boiler plant.

In this article, the fourth in a series,* the author shows that while correct chemical conditioning of boiler water prevents the formation of hard scale at heating surfaces and decreases the risk of corrosion, it can also leave other serious problems

The theory governing the conditioning of boiler waters is concerned with the acidic rather than the basic radicles of the chemicals used. This is the reverse of successful water softening, where the aim is to remove the scale-forming bases, calcium and magnesium, but which, apart from the bicarbonates, has little effect on the acidic radicles, sulphates, chlorides and nitrates originally combined with the calcium and magnesium.

It is generally assumed that a solid whose solubility in water decreases with increasing temperature (negative solubility) will deposit itself as a hard scale at the heating surfaces of a boiler when the water becomes saturated with the substance. Conversely, when the solubility increases with increasing temperature (positive solubility) and saturation is reached, the solid substances will be found in the cooler portions of the boiler unit as a relatively soft deposit and also as a sludge suspension in the water. The latter condition is made use of in preventing scale formation at boiler heating surfaces.

Hard Scale Formation

Calcium sulphate, which has a negative solubility, is the most frequent major constituent of hard boiler scale. Calcium carbonate, on the other hand, does not itself form a hard scale at heating surfaces. If, therefore, a certain ratio of soluble carbonate radicle (CO_3) to the soluble sulphate radicle (SO_4) is maintained in a boiler water, then calcium sulphate entering a boiler will be deposited as the soft carbonate and not as the hard calcium-sulphate scale. If the carbonate/sulphate ratio is not properly maintained, hard scales consisting of varying mixtures of calcium carbonate and sulphate will form at the heating surfaces. In practice, this ratio is maintained by having soda ash (sodium carbonate) dissolved in the boiler water, and as calcium sulphate enters the unit *via* the feed water it is finally deposited as soft carbonate, and the sulphate radicle remains in solution as sodium sulphate, a very soluble substance: $CaSO_4 + Na_2CO_3 = CaCO_3 + Na_2SO_4$.

Sodium sulphate will thus have a tendency to increase in concentration, and additions of soda ash will be required to maintain the required carbonate/sulphate ratio. Magnesium salts such as sulphate and chloride would be converted by the soda ash into the somewhat soluble carbonate, but the latter would be hydrolysed into the almost insoluble hydroxide, which would be precipitated as a sludge. In any case, the magnesium would probably be converted into the hydroxide since, even at very low pressures, a portion of the soda ash is hydrolysed to caustic soda, which would remove the magnesium from solution in the form mentioned.

This production of caustic soda in a boiler water will also prevent the formation of magnesium silicate scale at the heating surfaces, but it may not stop calcium silicate appearing as a constituent of hard scale. The use of soda ash as a boiler water conditioning chemical, then, results in the scale-forming materials being precipitated as calcium carbonate and/or magnesium hydroxide sludges.

Avoiding Sludge Deposits

If the quantity of calcium and magnesium salts in the boiler feed water is large, the resultant amount of sludge will also be high. To counteract the possibility of its being deposited as a soft scale in the cooler parts of the boiler unit and affecting circulation due to poor heat transfer and partial blockage of tubes, it may be necessary to add sodium aluminate to keep the sludge free flowing, and thus enable a quantity of it to be removed by blowing down after the boiler has been banked.

Priming, due to large amounts of suspended matter in the boiler water, particularly if the particles are very fine and if an undue amount of alkalinity is present, is reduced by the coagulation of these particles by means of sodium aluminate.

If the boiler feed or make-up water is previously lime-soda softened, the process can usually be adjusted to maintain the carbonate/sulphate ratio. The appropriate value of this ratio increases with the boiler pressure. The decomposition of soda ash into CO_2 and caustic soda also increases with the pressure and the rating of the boiler. Some difficulty may therefore be experienced at pressures at from 200-250 lb. per sq. in. in maintaining the required ratio, and the formation of caustic soda may make it necessary to take precautions against caustic embrittlement of boiler plate. This implies the use of a further ratio of either carbonate/caustic soda or sulphate/caustic soda in the boiler waters.

At boiler pressures exceeding 250 lb./sq. in. it is not practicable to condition the boiler water with soda ash, and the formation of hard scale at heating surfaces may be prevented by the use of one or other of the sodium phospates. The results of the interaction of the latter with caustic soda are: (1) $NaH_2PO_4 + 2NaOH = Na_3PO_4 + 2H_2O$, and (2) $Na_2HPO_4 + NaOH = Na_3PO_4 + H_2O$.

Use of Phosphate Radicle

The principle governing the use of the phosphate radicle is the same as that of carbonate conditioning, *i.e.*, the maintenance of a phosphate/sulphate ratio in solution in the boiler waters. The scale-forming materials are precipitated as a sludge in the form of insoluble phosphates and magnesium hydroxide. The heating surfaces of the boiler will thus be kept clean, but as with the carbonate a soft deposit may form elsewhere.

The possibility of calcium silicate scale formation when conditioning with soda ash is due to both calcium carbonate and hydroxide being slightly soluble under these conditions, and the presence of silica may result in a silicate scale being formed. With phosphate conditioning, however, all the magnesium and calcium salts are removed from solution and a silicate scale cannot form. As with carbonate conditioning, the correct phosphate/sulphate ratio increases with the boiler pressure.

The phosphate radicle (PO_4), unlike soda ash, is stable in all present-day boiler conditions. For successful phosphate conditioning free caustic soda must be present in the boiler waters in addition to trisodium phosphate, the latter being in excess of the required phosphate/sulphate ratio, since the concentrations of soluble carbonate and sulphate will increase. The soda ash will decompose at the higher boiler pressures into CO_2 and caustic soda, with consequent increase in concentration of the latter.

Effects of Calgon

Caustic soda concentration may be reduced by blowing down or by the addition of phosphate in correct form. Calgon or sodium hexa-metaphosphate, $(NaPO_3)_6$, is also used for maintaining the requisite phosphate concentration; it also has the important property of reducing the caustic alkalinity and itself being converted into tri-sodium phosphate.

Calgon is capable of retaining calcium salts in solution in a feed water until it reaches the boiler, where tri-calcium phosphate is precipitated as a sludge and the excess Calgon is converted into tri-sodium phosphate. Mono-sodium phosphate gives an acid solution with water, and should on no account be used with any continuity. Chemical conditioning of boiler water usually results in an increase in the *p*H value and therefore a decrease in the likelihood of corrosion.

* "Boiler Make-up Water," January 13th.
"Water Softening," May 5th.
"Feed-water Treatment," August 25th.

Caustic embrittlement shows itself in the form of cracks in butt straps, rivets, &c., resulting from contact between metal stressed above the yield point and a solution containing not less than 100 grammes of caustic soda per litre. Hydrogen is evolved and hair cracks develop between the crystals and not across their faces. The crystals are not deformed as is usual with failures due to fatigue.

To produce embrittlement the presence of caustic soda containing small amounts of sodium silicate is essential (which in practice is usual) and seepage of boiler water into riveted seams and butt straps followed by evaporation produces the requisite concentration of caustic soda. If, however, either solid sodium carbonate or sodium sulphate also crystallise, embrittlement is prevented. This forms the basis of a method for inhibiting caustic embrittlement by maintaining ratios of carbonate/caustic soda at lower pressures, and sulphate/caustic soda at higher pressures. These ratios must be increased as the boiler pressure rises. At 600 lb. per sq. in. the ratio of sodium sulphate to caustic soda has to be about 3 to 1. The possibilities of scale and consequent boiler tube failure are, however, usually much greater than those of caustic embrittlement.

"Carry-over" and Turbine Blade Fouling

As distinct from priming,the carry-over of small particles of boiler water with the steam, which then becomes contaminated with some of the solid material originally dissolved in the water, may damage superheater tubes and interfere with the efficient running of steam turbines. Carry-over is generally more in evidence in boilers which have water walls, and turbine-blade fouling is usually associated with steam temperature and the type of solid material dissolved in the boiler waters.

Caustic soda is a necessary constituent of the latter and at steam temperatures above its melting point (about 600 deg. F.) it will in fluid form stick to metal surfaces and also trap particles of any solid material in the steam, *e.g.*, sodium chloride, sodium sulphate and sodium phosphate, which, having comparatively high melting points, may be carried over as solid particles.

The amount of caustic soda found in these deposits is usually small—by the time the deposit has been obtained CO_2 has probably converted most of this material into sodium carbonate. A typical analysis of blade-fouling deposit from boilers conditioned with caustic soda and tri-sodium phosphate, but not maintaining the sulphate/caustic ratio for inhibiting caustic embrittlement, gives the following percentages by weight:—Caustic soda 2, sodium carbonate 60, sodium chloride 30, sodium sulphate 1, sodium phosphate 1 and iron oxide, water, &c., 6.

The ratio of sodium carbonate to salt in these deposits varies considerably with the positions from which they are taken, *i.e.*, the temperature. The sulphate and phosphate are in relatively small amounts, although the boiler waters contained something like the following in gr. per gal. during the period when the deposits collected: Caustic soda, 10 to 20; sodium chloride, 10 to 50; sodium phosphate, 5 to 15; and sodium sulphate, 5 to 50.

As caustic soda at temperatures considerably above its melting point does not stick to the blades to the same extent as at lower temperatures, only those wheels in the particular temperature range become fouled. Although the amount of solid material carried over per unit volume of steam may be extremely small and difficult to find by ordinary chemical tests, yet turbine blade fouling proceeds. Some steam purifiers and separators are of little use in preventing carry-over, the cause of which is often attributed to the chemicals used in conditioning.

Sample Tests

As a reduction in steam temperature causes the carry-over materials to adhere to metal surfaces, dissolved solids would be removed from the steam at the point where the temperature drop occurred, and no useful information would be obtained by condensing small quantities of superheated steam. One therefore has to sample the saturated steam suitably from air cocks in the saturated steam lines connected to small water-cooled coil condensers.

The water could be put through a recording instrument giving electrical resistance and samples analysed at intervals. Carry-over could thus be watched in terms of boiler load, water level and concentration of chemicals in the boiler water, each of which is related to the concentration of solids in the steam. If there are two wet-steam lines, samples should be obtained from both; if more than two, from the two outside lines. This point is stressed, because the amount of carry-over may not be consistent along the whole water surface.

If there were no dissolved matter in a boiler water, there could be no solids in the steam and blade fouling would not occur, but to say that there would be no carry-over under these conditions is another matter. The rate of steam liberation per unit area of water surface in certain types of high-pressure boilers has increased very considerably during the last decade and in many instances the return tubes to the steam drum are normally below water level. These conditions are suggested as being the real cause of carry-over, rather than the fact of having some few gr. per gal. of chemicals dissolved in the boiler waters. If that be so, a boiler plant running to capacity with relatively long periods on overload will produce more carry-over and blade fouling than will a similar plant having a quieter life.

Concentration and Priming

It is my experience that the increase in carry-over up to certain limits is in direct proportion to the concentration of chemicals in the boiler water. Above certain limits of chemical concentration priming will probably occur. Carry-over gradually reduces the concentration of chemicals in the boiler waters, the solids in the steam falling in like manner, and even with as small a quantity as 5 gr. per gal. total solids in the boiler water some of these can be easily detected in the steam.

Priming gives much more erratic steam pollution than does carry-over (which is remarkably consistent in its results), and a fairly sharp line of demarcation can be drawn between the two. Even one part of solid carry-over material in several million parts of steam has seriously affected the capacity of large base-load turbines within a period of about five to six weeks.

Base-load conditions in a power plant can have a considerable bearing on the effects of steam carry-over. In most cases the deposits on the blades consist of materials 90 per cent. or more of which are soluble in water, and the blades can be quickly cleaned with a jet of warm water. Base-load turbines up to 20,000 kW are not too big to be cooled sufficiently when shut down to permit the first whiffs of steam on starting-up to condense on the wheels by this means washing away soluble deposit.

If samples of condensate are collected before a turbine begins to turn, and afterwards at increasing intervals from a minute upwards, the presence of deposit on the blades will be evident with the first quantity of true condensate, and will continue for some time.

The amount of material washed off the blades at starting-up is sometimes sufficient to warrant the condensate being put down the drain. Silica from sand filters in the water used for boiler feed or make-up supply may be carried over with the steam, fouling the lower-pressure cylinder blades; as this cannot be washed off opening up and scraping may become necessary.

Boilers with "Streaky" Circulation

To maintain sufficient chemicals to cater for a section of a boiler with "streaky" circulation which normally has the lowest concentration may, in some plants, mean excessive carry-over, and one may have to treat corrosion as a secondary matter. In a base-load plant turbine shut-downs for blade washing are costly, and in consequence boiler-water conditioning may suffer. A compromise may thus have to be made, and when the problem is complicated by uneven circulation in the boiler units, the oxygen content of the boiler feed water will have to be a very low figure or boiler corrosion will certainly result.

Condensation trapped in the loops of superheaters when shut down helps to concentrate soluble deposit in the tubes, and the more a boiler is in and out of service the more quickly deposit accumulates at the bends with consequent overheating, chemical action and tube failure. Samples of the condensed steam, obtained by syphoning from the tubes, will give useful information.

While correct chemical conditioning of boiler water prevents the formation of hard scale at heating surfaces and decreases the risk of corrosion, it can also leave other serious problems to be solved. Thus, when condenser leaks occur three or four times a month, and attention to this is not immediately possible, excess of conditioning chemicals must be maintained in the boiler waters. Under these conditions, sludge and suspended matter accumulate in the boiler, being deposited in the upper tubes or clogging the drains, in this way bringing about a decrease in the efficiency of steam separators or purifiers.

If the sulphate/caustic ratio were maintained in boilers whose feed water was polluted with scale-forming materials and salt, it would probably be necessary (even with low oxygen content) to maintain something like 10 to 15 gr. per gal. of caustic soda in the boiler waters to prevent corrosion, and therefore at pressures of 400 lb. per sq. in. and over,

(*Concluded at foot of next page*)

NOVEL SUB-STANDARD METER

Design Evolved After a Study of Test Room Requirements

By H. E. Parker

IT is usually necessary to employ at least two ordinary rotating sub-standard instruments to check a batch of meters from full load down to one-twentieth load; one serves from full to one-quarter load and the other, with a lower current rating, serves for one-tenth and one-twentieth loads, thus avoiding running a sub-standard meter below one-quarter load, which the Electricity Commissioners do not allow.

The sub-standard instrument here described has been produced to overcome this difficulty, and to cover a large range accurately with one meter, particularly with small loads. A model has been in continuous use for over a year, checking thousands of meters, and has given every satisfaction.

It consists of a meter element of the same type as that with which it is proposed to be used most, complete with rotor, bearings, magnet and an indicator. A multi-range current transformer is connected as shown in the diagram and a pair of stout flexible leads are calibrated with it. With DC a similar system can be employed by using a multi-range current shunt and a DC meter element.

Method of Construction

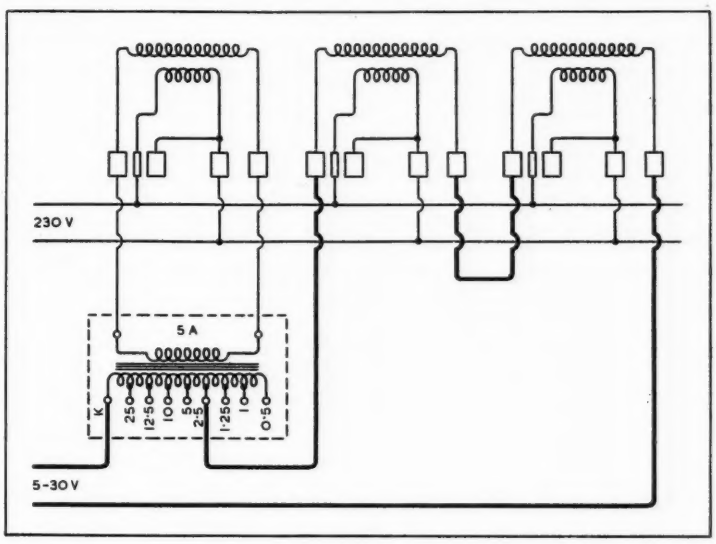
A 5-A, 200-250-V, 50-cycle meter is chosen from stock, the counter removed and a revolution indicator fitted; this consists of a balanced pointer and worm wheel only, the pointer moving over a scale divided at every five revolutions and adjusted to be on a division when the calibration mark is in the centre at the front. The current circuit is connected by means of the stout leads to the secondary winding of the transformer, and calibrated carefully as a 5-A meter so that at full load and full load with 0.5 power factor there will be no errors.

The transformer is so wound that the primary tappings correspond to the current required for the usual test loads for the sizes of meters it is desired to cover. For 25-, 10-, and 5-A meters nine tappings are required, viz., 25, 12.5, 10, 5, 2.5, 1.25, 1.0, 0.5, 0.25/5 A secondary, giving top, half, tenth and twentieth loads on each size. A rating of 5VA allows for fairly long leads and an ammeter if desired.

Since the transformer is always supplying the same burden at either unity or 0.5 power factor, considerable saving can be made in the size and quality of the core and a low value of ampere-turns is quite satisfactory. For example, a silicon iron shell type stamping 4 in. by 4 in. by 1½ in. required 95 ampere-turns on the secondary and 100 ampere-turns on the primary; the secondary was one winding of 400 turns tapped according to the number of turns required to give the nine ratios, the size of wire being appropriate to the current it had to carry. A small compensating winding was found helpful in overcoming phase error due to flux leakage with this type of stamping.

In operation, the sub-standard meter is supplied with the same potential on the shunt circuit as the meters under test. Assuming a batch of 25-A meters are to be tested, the plug is inserted in the multi-range transformer primary at 25 A and full load at unity power factor is then set on the board instruments.

The usual number of revolutions is run, say 50, and the error of the meters read by comparison in the usual way, the sub-standard being stopped in the front; next with 0.5 power factor setting the meters are run for, say 25 revolutions and again the sub-standard runs the same number of revolutions. The transformer plug is inserted at 12.5 A and half load is set; now the sub-standard does twice the revolutions of the meters under test, the usual number of revolutions is run on the test meters and the errors taken by comparison with a sub-standard error of ± 0.



Test Diagram

Tenth load is set in the same way, but the sub-standard does ten times the number of revolutions of the meters under test with proportionately greater accuracy, and one-twentieth load requires the sub-standard to do 100 revolutions for five revolutions of the test meters and still the error of the sub-standard is ± 0, as it is on full load all the time and, of course, preserves full load accuracy with regard to friction, which is most important.

When checking the sub-standard instrument periodically, it is only really necessary to take two or three ranges to be assured that all are correct, which saves a lot of tedious checking and cross checking on one-twentieth load.

It should be pointed out that for one meter of a type to check the range of different sizes that the transformer covers it is necessary for the revolutions per kWh multiplied by full load amperes to be a constant. This is so with many makes of meters.

Conditioned Boiler Water (*Concluded from preceding page*)

30 to 45 gr. per gal. of sodium sulphate would be necessary. An ingress of calcium salts when there was a deficiency of the phosphate radicle would quickly result in wall tube failure due to calcium-sulphate scale formation.

Salt and sodium-sulphate concentrations are due over a period either to circulating water leaking into the system, to evaporators priming or to a combination of these. Curves showing the ratio of salt to sulphate in the boiler waters, circulating water and evaporator feed during the period in question will probably help to decide the source of the pollution.

Condenser leaks do not affect all the units of a large boiler plant to the same extent, and when there is no provision for conditioning the boilers separately the maintenance of ratios and concentrations is difficult. Should this be complicated by carry-over, one obvious plan is to forget caustic embrittlement and to concentrate on scale prevention and carry-over reduction. An American method for dealing with the latter consists in maintaining a ratio of 4 to 5 sodium sulphite to 1 of caustic soda in the boiler waters.

The sulphite is carried over as a dry powder in the superheated steam, and "dusts" the small particles of molten caustic soda, which are thus prevented from adhering to turbine blades. The sulphite would be gradually oxidised in the boilers to sulphate which may be a possible objection to it.

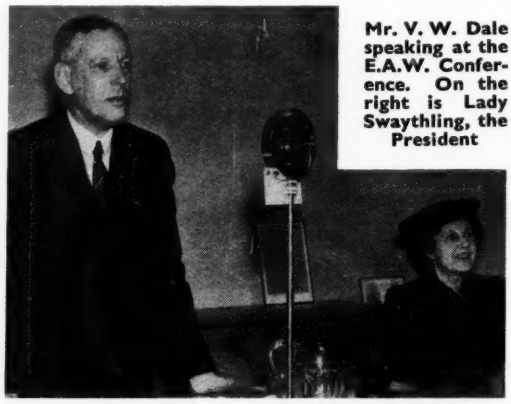
Another objection is that about 10 gr. per gal. of caustic soda has often to be maintained to prevent corrosion; this would mean a further 30 to 50 gr. per gal. of other material and some high-pressure, high-duty boilers of the present day would not stand these concentrations. It is becoming a practice to include a clause in boiler specifications which covers the quality of the steam in terms of minute amounts of carry-over, and as manufacturers are accepting this it may be taken as a good sign.

ELECTRICITY IN WARTIME

E.A.W. Discusses Home Uses

VARIOUS aspects and problems of the domestic use of electricity in wartime were the interesting subjects of discussions at the one-day London and South-Eastern Area conference arranged by the London Branch of the Electrical Association for Women on Wednesday last week. Opening the morning session, the Dowager Lady Swaythling, president of the Association, congratulated Miss Caroline Haslett, the director, on the way the E.A.W. had adapted itself to wartime conditions and was still performing work which kept up its usual high standard.

Speaking on "Electricity in the Home in Wartime," Mr. V. W. Dale, business manager of the British Electrical Development Association, first congratulated the E.A.W. on the public spirit shown in carrying on with its conference. Whether the war was long or short, the world would never be the same again. Everything would suffer from dilution and everyone would have to cut their coat according to a new measure. Housewives would find themselves faced with a number of problems and many of them would have to undertake tasks that they had thought they had left behind them for ever. More and more, therefore, would labour-saving devices be required.



Mr. V. W. Dale speaking at the E.A.W. Conference. On the right is Lady Swaythling, the President

Electricity supply services should be maintained and used from patriotic motives in wartime and he suggested that members of the E.A.W. should regard themselves as missionaries to make this fact known. Electricity supply was not merely an industry but a social service which we must endeavour to hold on to. It was important to get a view of its historical background. There was no comparison between the position in 1914 and that to-day. In 1914 there were fewer than 600,000 consumers: there were now nine million. Assuming that the average family comprised four to five persons there were about 40 million people in the country who, if they were not electrically minded, were at least electricity conscious. This was a wonderful achievement which was unequalled by any other country in the world. In spite of this there were still people who feared electricity and this was the chief reason why it was not being used more extensively for purposes other than lighting.

How many people, asked Mr. Dale, were aware that, in spite of the fact that it was only about fifty years old, the electrical industry was among the first six in order of importance in the country, and now employed directly or indirectly nearly a million persons. In 1914 the revenue earned by electricity supply undertakings amounted to about £14 million: by 1939 it had risen to £90-£100 million. Energy sold, too, had increased from 3,000 million to 20,000 million kWh and, whereas in 1914 it needed 2½ lb. of coal to produce 1 kWh, to-day only 1 lb. was needed. The effect of this more efficient operation was that the electricity supply industry was virtually making the nation a present of 14 million tons of coal a year.

Miss Ellen Wilkinson deals with hire-purchase. Miss Haslett is on the right

To-day there were seventeen homes electrified for every one in 1914. One house in three now had an electric iron and a vacuum cleaner as compared with only one in twelve. Electric fires, besides increasing the general standard of comfort, eliminated a very large amount of work and dirt. Electric water heaters, virtually unknown in 1914, were now used in nearly a million homes, while for every one home using an electric cooker then a thousand had cookers to-day. In fact, the period after the 1914-18 war had marked the beginning of domestic electrification.

It would appear to be more patriotic to bring coal to one central point than to deliver it to individuals and then collect the dust. By utilising electricity, therefore, we were performing a national service and could consider ourselves perfectly justified in using to full advantage the ration of electricity allowed under the Fuel and Lighting Order. A readjustment of ideas was, however, necessary in order to use electricity more amply, intelligently and economically. No one was going to recommend waste, but that did not mean that one should not review the electrical facilities in the home. It might, for example, in certain circumstances be patriotic to buy a breakfast cooker to use instead of the normal cooker or to obtain a portable fire for short-period heating.

With the relaxation of the rationing restrictions to enable consumers to use the same quantity of electricity as last year, it might be thought that there was nothing to worry about now. Increasing appreciation of the advantages and comforts of electricity, however, tended to make consumption rise so there was a necessity to keep reasonably to the amount used last year. A simple form had therefore been prepared to enable members to "watch their step." But care should be taken not to economise so severely as to run the risk of injuring health.

Good interior lighting was particularly desirable in these days of black-out and it was important that we should educate our friends as to how little electricity was used for it and how cheap it was. Once the fixed charge of a two-part tariff was paid, the annual cost of electricity for lighting an average house was only about 5s. In wartime light should, of course, be used only where wanted, but where it *was* wanted it should be good. Black-out not black-in should be the motto, and with the increased accident risks outdoors we should do all we could to make indoors as safe as possible, and also as cheerful as possible. Heating and water heating offered the greatest scope for economising electricity, and any appliance which was uneconomic to use should be put out of service and another substituted. A 6-pt. kettle would be found a very worth-while appliance to possess. E.A.W. members could do valuable work in seeing that electricity showrooms continued to operate normally and they should make a point of visiting them to obtain hints.

Miss Haslett took the chair at the luncheon which followed the morning session. She congratulated the branches on their work and mentioned that one had "adopted" an anti-aircraft brigade on the North-East Coast, while the Croydon Branch had taken over the local A.R.P. canteen.

Speaking on "The Hire-Purchase Act in Wartime," Miss Ellen Wilkinson, M.P., who is a vice-president of the Association, pointed out various abuses committed against persons who were unaware of the legal position in the event of their being unable, on account of the war, to keep up their payments. Under the Courts Emergency Powers Act, she said, goods could not be repossessed except by agreement with the hirer or under a court order. The Act, however, related only to agreements entered into before the war, and the practice was growing up for debt collecting agencies to induce people to sign new agreements which would place them outside the Act. While urging people not to sign new agreements, Miss Wilkinson said she did not mean that they should not offer reduced payments if they needed.

Some useful hints on the economical use of domestic appliances were given by Miss Dorothy Vaughan at the afternoon session. The war, she said, provided a wonderful opportunity for putting one's house in order, for without doing so it was impossible to hope that it would operate efficiently.

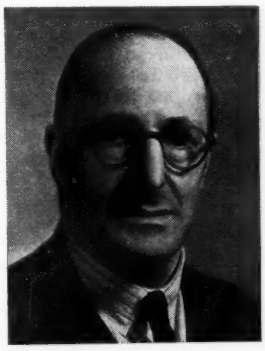
INSTITUTION PROCEEDINGS

Papers and Addresses

Electricity's Future

SINCE hardly any of the activities of mankind are to-day possible without the aid of electricity, it is usually described as man's greatest civilising influence and an essential factor in progress. Such is the theme of the address prepared by Mr. H. Joseph (managing director, Midland Electric Installation Co., Ltd.) as chairman of the South Midland Centre (Birmingham) of the Institution of Electrical Engineers, which has been issued without being read at a meeting.

Because electricity is an essential aid to development, its extended use is desirable; but Mr. Joseph thinks that a critical phase has been reached at which generation has grown beyond means of control. Long before switchgear testing plant can earn enough to pay for itself, it will have become obsolete. It is in the direction of high-voltage switchgear, more than any other, that the supply section of the industry looks for some radical departure from principle.



[*H. J. Whitlock & Sons, Ltd.*
Mr. H. Joseph

Turning to utilisation, the greater facility with which the speed of DC motors can be adjusted is emphasised. The cost of variable-speed AC motors is considered to be too high for their more general adoption, remembering that the onus for power factor correction is upon the consumer. The author appears to regard AC as a raw material, hoping that the finished product in the form of DC may in future be offered on equally economical terms.

Research in various directions can be expected to lead to greater utilisation of electricity. For example, present means of transferring heat to domestic utensils must be greatly improved before they can entirely displace non-electrical methods of cooking. To cope with the very large loads which must inevitably result from the complete electrical equipment of ordinary dwellings it will become necessary for drastic alterations to be made to distribution systems. It is probable that high- and low-voltage distributors will be laid side by side, connected at intervals by transformers, extra ones being inserted as the load grows. Something of this kind has already been done in certain districts.

Rate-of-increase Curves

It is not considered unreasonable to suppose that, like all other natural phenomena, the progress of civilisation, together with its various constituent elements, are governed by definite mathematical laws. To arrive at some approximation to the nature of such laws Mr. Joseph has used British records to plot rate-of-increase curves indicating the growth of typical amenities. Most such curves appear to resemble fairly closely the calculated exponential equivalents drawn to the same scale. This is true in the case of kWh sold, but the maximum demand on undertakings during the same period has tended to lag a little behind the theoretical for the last two years, perhaps fortunately. A curve representing the increasing use of motor cars reveals a check caused by the 1914-18 war and also a subsequent over-shooting of the exponential before recovery settled down again to a very nearly natural rise. Similar indications are provided by the mileage flown per annum by Imperial Airways machines, by the number of telephones installed, and by wireless licences issued; in the last-mentioned case a flattening of the curve since 1932 is suggestive of the onset of saturation.

The curve of I.E.E. membership, controlled by so many factors that depend upon policy, cannot be expected to follow any natural law, but it also exhibits a dip due to the war years, though since 1922 it has followed a nearly straight-line law, a state of affairs that is not satisfactory in view of the much more rapid growth of everything else electrical.

If these curves represent at all fairly the progress of civilisation in general and of electrical development in particular, what can one hope to learn from them regarding future possibilities? Since 1922 the kWh sold has multiplied six times. If extended exponentially to 1970 to-day's figure of about 20 thousand million would be increased to 562 thousand million, or twenty-eight times its present value. If further extended to the year 2,000, say roughly doubling the period to date since the commercial distribution of electricity commenced, the astounding figure of 10,790 thousand million would be attained, or 540 times to-day's net sale of electricity.

Are we still at the beginning, or will the curve begin to alter in shape as saturation sets in?

Trolley-bus Design

THE first of the 1939-40 session papers to be issued without being read at a meeting of the Institution of Electrical Engineers (available to members on application) is by Mr. G. F. Sinclair (London Passenger Transport Board) and describes the principles upon which double-deck trolley-buses are now constructed.

In this country single DC motor drive to the back axle is universal, service characteristics being sufficiently similar to allow for standardisation on three-axle vehicles weighing 13.5 tons unladen, rated at 95 HP or less in the case of two-axle vehicles. Speed on the level is about 12 MPH and is regulated by adjustment of the motor excitation; field weakening for increasing speed can be done by shunting or tapping in the case of a series machine, or by inserting resistance in the shunt field and diverting the series field in the case of a compound machine.

Compared with the use of two motors, the loss of energy in the starting resistances of the single motor is more than offset by the mechanical and electrical advantages in respect of maintenance and lower capital cost. The yearly cost of energy for a trolley-bus at 0.5d. per kWh is £286, assuming an annual mileage of 50,000. The saving that would result from the use of more complicated series-parallel control would be of the order of 8 per cent.

A pedal-operated master controller actuates electro-magnetic contactors, while rheostatic and compressed-air brakes are controlled by a single pedal. Electrical braking is more irregular with a series than with a compound motor; compound excitation controls the braking, the series field in opposition to the shunt field automatically regulating the effort down to a vehicle speed of 4 MPH. This characteristic prevents wheel skidding and limits the stresses liable to be applied to the transmission system.

A compound motor permits of regeneration to the line being obtained on the accelerator pedal, which can effectively reduce the vehicle speed to 15 MPH. A transmission brake operated by the backward movement of the power pedal, so exerting a retarding torque that is less than the maximum accelerating torque, is a valuable asset in driving. When the supply line is receptive this regenerated current results in a reduction of energy consumption.

Regeneration

Present practice is to employ a relatively light shunt and a strong series field, tapped for speed regulation. The shunt augments the series winding during motoring, thus regenerating about 40 A. During rheostatic braking the shunt field alone is used, the regeneration then being sufficient for a retardation of about 1 MPH per second from 30 to 20 MPH. High regenerative voltages are avoided, so easing the sub-station problem when there is not sufficient load on a rectifier-fed section to absorb regenerated energy.

The method of winding and yoke-thickening to improve commutation and reliability in service are described in the paper, together with the control gear and protective relays employed. A valuable addition is a change-over switch for placing batteries in series (70 V at no load) for propelling the vehicle at 5 MPH in emergencies, the shunt field of the compound motor not being energised. This arrangement has been most beneficial for manœuvring in traffic.

The 96-Ah battery is used mainly for this purpose and for some lighting when the vehicle is being cleaned in the depôt. It can be charged at will by a motor-generator set, which also provides constant vehicle illumination irrespective of the vehicle speed or battery condition. The two portions of the machine are specially insulated from each other, since low voltage lighting is compulsory with all-metal bodies.

The author refers to means of guarding against the accumulation of static electric charges on the vehicles and more briefly to the suppression of interference with radio reception. He next deals with mechanical parts and chassis-less

design made possible by all-metal body construction, finally discussing current collection from the 600-V overhead wire system, which is constructed for feeding in sections not more than half a mile in length. In many cases the distribution is not earthed, so minimising the effect of accidental earthing of a conductor and limiting the maximum leakage current.

The author states that the acceleration, braking, and simplicity of control of the trolley-bus are advantages which permit of a better road performance than can be obtained from other types of passenger vehicles. In service the number of stops is large where the density of passengers is heavy, a duty cycle singularly suited to the characteristics of the trolley-bus. On hilly routes a margin of speed is available, *e.g.*, a 12-ton trolley-bus can climb a 1 in 9 gradient at a speed of 20 MPH starting from rest.

Neither the car-mile nor the seat-mile basis for costing provides a formula which takes care of all the variables. The essential difference in the capital structure of a trolley-bus system as compared with a system served by self-contained power units lies in the fixed asset of the overhead lines and cables. The apportionment of the charge on this capital on a vehicle-mile basis varies inversely as the frequency of the trolley-bus services. The cost of maintenance of the overhead line increases to a limited extent with any increase in the headway.

The total cost per trolley-bus mile for capital charges and maintenance of overhead lines and cables has been estimated from the Ministry of Transport return and other statistics. The cost per vehicle mile varies from 0.6d. to 1.1d. on headways of one to six minutes, assuming a reasonable life for the equipment and allowance for wear and tear and obsolescence. The standard of maintenance and the method of overhead construction are factors in the cost which differ with each undertaking.

In addition to these charges there is a rating charge on trolley-bus systems, an assessment which in some instances is fixed as to value by the respective local authorities. Against these overhead-line costs can be offset the advantages to be obtained from trolley-bus operation of increased carrying capacity, lower vehicle maintenance, and higher schedule speeds.

Cost Comparison

The regulations governing the construction of vehicles in Britain enable trolley-buses to be built 1 ton heavier than other forms of road passenger vehicles. The cost of maintaining a 70-seater trolley-bus is no greater than that of the much smaller Diesel bus. The capital charges on the vehicles, taken over a period of twelve years and assuming similar seating capacities, show little difference between the two types on a mileage basis. The average energy consumption for trolley-buses operating an intensive service on a comparatively flat route is approximately 2.75 kWh per car-mile, measured at the sub-station. The price of DC varies from 0.5d. to 0.8d. per kWh, and at the highest figure the cost per ton-mile is high when compared with that for the Diesel bus, whereas at 0.5d. per kWh the comparison is favourable.

For passenger services in densely populated areas the vehicle with comparable costs which can perform the cycle of stopping and starting to pick up and set down the greatest number of fare-paying passengers in the least time will provide economies. The high acceleration of the trolley-bus due to the overload capacity of the motor gives the facility for operating high schedule speeds.

The most severe critics of the trolley-bus acknowledge its fine riding qualities and noiseless operation. The ability to marshal vehicles in different areas and the use of non-stop vehicles play little part in the everyday movement of the people to and from work on our roads in our towns and cities. The travelling public has shown appreciation of the comfort in travel of the trolley-bus, as is witnessed by the sustained popularity of the vehicle and the increased volume, in many instances, of week-end traffic. The residential population and business people on the routes served by trolley-buses have greatly benefited from the smooth and quiet running of the vehicles.

Electric Cable Development

THE development of electric cables, including references to process plants, was surveyed by Mr. F. W. Main (Enfield Cable Works, Ltd.) in his presidential address to the London Branch of the Association of Mining Electrical Engineers on November 7th, and the address was well illustrated.

More than 50 per cent. of the capital of electricity supply undertakings was invested in cable, he said. In few other fields had men deviated more from customary practice, dared the revolutionary and unorthodox and faced resulting criticism. It was by the subtle manner in which it held its secrets that the electric cable had eventually attracted the investigator, and the keys of the mathematician, the engineer, the physicist and the chemist had all ultimately been applied to its successful development.

Mr. Main illustrated the first cable in London for public supply, laid in 1881, consisting of bare copper drawn into steel pipe with spacers, the pipe then being filled up with a tar compound, the two solid copper conductors being D-shaped; and the classical Ferranti cable, made in London and laid in 1890, which was the forerunner of the paper-insulated cable used universally to-day.

Discussing the lead sheathing of cables in the ordinary vertical press he illustrated the elements of a die-box, and showed, with the aid of flow sketches, how the lead divided and thereby produced welds at the top and bottom of the sheath. The efficiency of the union of those flows of lead depended upon the design of die-box, the method of filling the container from the melting pot and the regulation of temperature and speed of operation. The modified pipe press was used in all countries with success, but failures were not unknown. Henley's straight-through press, designed by Mr. E. E. Judge so that the lead did not divide, and both Henley's and the Pirelli-General continuous lead presses were described by Mr. Main, who said that in another type, which was really an improvement of the older vertical pattern, after the lead was melted the surface was prevented from coming into contact with the atmosphere, so that oxidation could not occur; the container was charged under vacuum.

Graded Dielectric

During the last 15 years great advances in quality had been effected by improved paper taping, particularly with reference to tension of the papers and lapping precision, more efficient drying of the cable before actual impregnation, the employment of better impregnating compounds, improved preparation of compound before use, and more thorough impregnation of the paper.

After pointing out that the results of development research were shown by the improved power factor, breakdown strength and stability of the cable, resulting in the reduction of the dielectric thickness for the same factor of safety, which had made possible the production of a smaller and lighter cable, Mr. Main went on to deal with the testing of cables, stress measurement, &c. In a cable having a homogeneous dielectric, he said, the maximum electric stress was at the surface of the conductor, due to the value of capacity of each annular element of the dielectric from the surface of the conductor to the outer sheath not being a constant quantity, but actually increasing.

The thickness of the dielectric had, therefore, to be designed to give a safe stress at the conductor surface, but that was not economical as the dielectric in proximity to the lead sheath was stressed to a less extent. To overcome that, grading of the dielectric had been examined. The ideal would be to make the capacity per element of annular condenser constant throughout the dielectric, and an illustration showed that the diameter of a cable with graded ideal dielectric would be only about 50 per cent. of that with a homogeneous dielectric.

Another suggested method of obtaining more even distribution of stress in the dielectric of a high-voltage cable was to connect inter-sheaths placed in the dielectric to various points in the windings of the transformer, in order to anchor the potentials. That idea had been thoroughly investigated. The best cable makers to-day, said Mr. Main, were prepared to offer cables to work at 132 kV, or even as high as 220 kV.

Welding and Design

THE eighth annual Andrew Laing lecture was delivered before the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-on-Tyne on November 10th by Dr. B. P. Haigh (Professor of Applied Mechanics at the Royal Naval College, Greenwich) whose subject was electric welding as an integral part of structural design.

The lecturer declared that the process afforded opportunities for engineer-artists to design more strongly, more tastefully and more economically than ever before. Principles were first referred to and then data were quoted to show how reliably-strong welded joints could be made. Indeed, it was indicated that they were not merely stronger than riveted joints, but stronger to such a degree as appeared to justify important reductions in scantlings and also valuable changes in methods of structural design.

Thermal actions were considered briefly in relation to the security of the weld, indicating why the dangers of brittleness must be avoided. In this connection notched-bar tests had proved to be valuable in three distinct directions.

First, they were of special service for revealing brittleness due to various causes, because such tests produced severe local stresses immediately below the notch; and because these

stresses were commonly of the nature of "triple-tensile" stress, tending to cause brittle fatigue even in metals endowed with fair degrees of ductility as judged by other tests that produced stresses more of the nature of shear.

Secondly, notched-bar tests were of special value for comparing different steels as regards their suitability for welding, because the character of the stresses produced during the test had much in common with those produced by internal contraction. Hardness tests also were recommended for the same purpose, but they appeared to be open to the criticism that limitation of hardness did not necessarily ensure freedom from cracking. Thus, Prof. Haigh expressed the opinion that cracks might be formed in less hard samples as a consequence of the local changes of volume that occurred when Martensite, at low temperatures, changed to softer constituents of greater ductility.

In a third direction also, notched-bar testing had contributed to the development of structural welding practice, and in a curious and almost unexpected manner; it had revealed with scientific precision sources of danger which, although recognised in practical experience, were not clearly if at all indicated in other mechanical tests and were consequently liable to be regarded as heresies. Partly on account of this, the notched-bar test had become not only a serviceable auxiliary means of investigation, but also itself an object of scientific investigation.

Influence of Sample Size

The influence of size in relation to the incidence of brittle fracture was perhaps the most curious of such actions and certainly the most important in relation to structural practice. The contrast between fractures of large and smaller pieces of the same steel had often been declared to prove that flaws must have been present in the larger specimens, but that conclusion was seldom just. More commonly, the difference should be ascribed to the influence of size alone.

Fatigue tests had been carried out not only on simple machined samples, but also on larger samples cut from typical structures, or specially prepared under working conditions in shipyards. Samples had been tested under working conditions in the machine, as rolled, pitted, or deeply corroded, dry or moist under corrosion-fatigue conditions. Reliably safe limits of working stress had been determined not only for welded but also for riveted joints. Samples cut from the high-silicon steel plates of the Wallsend *Mauretania*, and arc-welded by methods now in current use, had under fatigue and also bending tests proved to be superior to any other samples yet tested at Greenwich.

Two elementary principles, the practical importance of the straight pull and of the triangle of forces as a basis of detail design, should ever be kept in mind in structural work. Respect for these principles would commonly double the strength of welded connections between rolled sections, and thereby justify the use of scantlings lighter than were now prescribed for general use. Lapped joints, whether riveted or welded, were much weaker than butt-welds. Channels and other unsymmetrical sections, when subject to shear, were commonly subjected to "secondary" stresses greater than the "primary" stresses; such sections tended to warp and "trip" under the action of the secondary stresses, giving grounds for the erroneous impressions that high factors of safety were desirable and that theory might be of little service in design. Symmetrical sections that could be welded although they could not readily be riveted, required only much lower factors of safety, provided that suitable precautions were taken to ensure that the lighter structures were immune against vibration and its consequences.

Tests had been carried out on structural details to illustrate the application of these and other principles of design, and comparisons showed how welding provided the means of using a little sound metal in the right place instead of more elsewhere; and theory could assist common-sense in the search for the right place.

But it must not be assumed that the full advantages to be gained in structural practice would immediately be available when welded joints were substituted for riveted, although an important increase of strength did indeed follow at once. Results of more far-reaching consequence were attainable by rearranging plates and rolled sections according to the elementary commonsense laws of mechanics, which were so hard to apply initially but so obvious when their applications had been found. By way of illustration the lecturer finally described a few typical changes that might become more general in the immediate future. One of the simplest and most remunerative of such changes was the use of symmetrical rolled sections, such as I bars and deep T sections, instead of channels and Z or other unsymmetrical sections hitherto employed to facilitate riveting, thereby gaining strength and stiffness or, alternatively, saving weight in an economical manner.

Colliery Surface Plant

"PLANNED Electrification" was the title of a talking film shown to members of the Lothians branch of the Association of Mining Electrical Engineers at a meeting in Edinburgh by Mr. G. D. Smith (Metropolitan-Vickers Electrical Co., Ltd.), who said that in recent years a very large sum of money spent on new equipment for collieries had been used for underground apparatus in order to increase output and reduce costs of coal-getting. With few exceptions, the surface plant had been neglected, and in many instances had reached a state in which maintenance charges were on an excessively high level.

Due to almost imperceptible deterioration of plant, the steady increase in maintenance charges was not noticed; consequently very few collieries had the courage to face wholesale modernisation of their surface plant. A large colliery company in England had had the courage to do this, and its efforts had, even in the short time since the completion of the installation, proved entirely satisfactory, from both the financial and practical points of view. The reorganisation was begun early in 1937, and completed about the middle of 1938, most of the work being carried out without curtailing the normal production of the colliery.

I.M.E.A. Activities

ACCORDING to the November *I.M.E.A. Journal* the I.E.E. has asked its Model General Conditions Committee to consider and report upon the additions which some manufacturers are charging on contract prices to cover War Risks Insurance.

In some notes on the latter subject it is pointed out that hired goods are not insurable where the hirer is not engaged in the business of selling, letting or hiring goods of the kind concerned and when provision is made for payment in not fewer than four instalments spread over a period of not less than six months. The opinion is expressed that goods such as cables, distribution accessories, plant on site but not erected, &c., are not insurable under Part II of the War Risks Insurance Act in so far as they are used for the production or distribution of electricity. Any goods not produced by an undertaking and intended for sale must, however, be insured.

Questions have been asked whether the practice of financing from surplus revenue the provision of new service connections, meters and other apparatus for hire is in order in view of the restrictions placed upon capital expenditure during the present emergency. The Electricity Commissioners have expressed the view that it would not be unreasonable to charge to surplus revenue expenditure incurred in giving a supply of electricity to new houses. On the general question, it is stated, some justification on grounds of present public need or war requirements is necessary.

Owing to the war the question of considering the proposals for the reorganisation of electricity distribution submitted to the Electricity Commissioners subsequent to the decision arrived at at the annual general meeting at Torquay has been deferred.

The I.M.E.A. Council is considering a draft clause to amend the Electricity Acts for the purpose of removing the present legal disabilities so that undertakings can enter into arrangements with bodies duly licensed by the Post Office for the rediffusion of broadcast programmes over distributing mains.

Representations have been made that the operation of the Electricity Supply (Meters) Act might be suspended during the present emergency. These representations will be considered at the War Emergency Joint Committee which has been set up with representatives of the company association. One point upon which the Electricity Commissioners have been approached relates to the compulsory testing of new meters by manufacturers, and it has been urged that undertakers with meter testing departments might be permitted to carry out their own testing. The Commissioners have stated that their decision regarding testing was arrived at with the fact in mind that under war conditions there would be a substantial falling-off in the number of meters requiring to be certified and to the necessity for concentrating certification as much as possible with a view to achieving economy in personnel. If, however, undertakings still have the necessary personnel and desire, for special reasons, to continue to operate their testing stations, the Commissioners are prepared to agree to their continuing, for the time being, to test and submit new meters for certification, providing they can make arrangements for a substantial reduction in the number of visits made by meter examiners to such testing stations.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

THE Home Secretary has appointed **Mr. A. W. Garrett** to be Chief Inspector of Factories in succession to **Sir Duncan Wilson,** who retires from the public service on December 27th. Mr. Garrett entered the Factory Department of the Home Office in 1906, and became Superintending Inspector in charge of the Midland Division in 1932. He was appointed Deputy Chief Inspector of Factories in January, 1937. During the last war he served in France with the Royal Engineers.

In our last issue we briefly announced that **Mr. G. K. Paton,** M.I.E.E., had relinquished his duties as engineer and manager of the North Wales Power Co. and Electricity Distribution of North Wales & District, Ltd., and that **Mr. R. A. S. Thwaites,** B.Sc., M.Inst.C.E., M.I.E.E., M.I.Mech.E., had been appointed to succeed him. Mr. Paton has been connected with the North Wales Power Co. since it commenced operations in 1906. Educated at Dumbarton Academy and at Heriot Watt

Mr. G. Paton

Mr. R. A. S. Thwaites

College, Edinburgh, he joined Bruce Peebles & Co., Ltd., with whom he had considerable experience in the various works departments, subsequently being in charge of the test department. Following a period of contract work he was responsible for the starting up of the original hydro-electric scheme in North Wales in 1906. He joined the North Wales Power & Traction Co., Ltd., at the end of 1907 as chief engineer, and in 1918 held the additional appointment of electrical engineer to the Aluminium Corporation, Ltd., at Dalgarrog. In conjunction with Sir Douglas Fox & Partners, consulting engineers, Mr. Paton was responsible for the carrying out of the technical scheme approved by the Electricity Commissioners, under the North Wales and South Cheshire Electricity Order, 1923, including the new hydro-electric station at Maentwrog. He is a director of the North Wales Power Co., Ltd., and Electricity Distribution of North Wales & District, Ltd., and will remain in North Wales as resident director of these companies.

Mr. Thwaites was educated at Dulwich College, and the City and Guilds (Engineering) College, South Kensington, and received his practical training with W. H. Allen Sons & Co., Ltd. (1908-1911), with whom he remained until 1922, during which period he carried out experimental and research work for the Admiralty and aero engine construction and testing. In 1922 he joined the Yorkshire Electric Power Co. as sales manager and technical assistant, joining the North Wales Power Co. in 1935, and for the past four years he has been assisting Mr. Paton, mainly on development work. Mr. Thwaites is a past chairman of the Yorkshire Centre of the Institution of Civil Engineers, a past president of the North Wales Branch of the Association of Mining Electrical Engineers, and he is the author of numerous papers and articles.

Sir Louis Sterling has been elected vice-chairman and managing director of A. C. Cossor, Ltd.

Mr. H. J. Smith, of St. Neots, district manager of the Bedfordshire, Cambridgeshire, and Huntingdonshire Electricity Co., is retiring at the end of the year.

Mr. L. Wilkes, acting manager of the Darwen Corporation transport undertaking, has been appointed manager and engineer at a salary of £450 per annum, rising to £550. Mr. Wilkes went to Darwen from Walsall Corporation Transport Department two years ago.

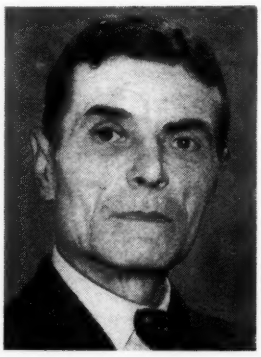
In the notes in our last issue relating to the career of **Mr. H. Long,** M.I.E.E., we should have stated that he has just completed a period of office on the Council of the I.E.S. (Illuminating Engineering Society)—not the I.E.E., and the references to his past chairmanship of the Midland Centre and the formation of the Midland (Nottingham) Sub-Centre also relate to the I.E.S.

Mr. H. Joseph, chairman of the South Midland Centre of the Institution of Electrical Engineers, whose address to that Centre is abstracted in this issue, was educated at King Edward's School, Birmingham, and subsequently took a three years' course in electrical engineering at Mason College (now Birmingham University). From 1897 to 1900 he was a pupil with Thomas Parker, Ltd., Wolverhampton, after which he was for a short period with the Harrow Electric Light & Power Co. as assistant engineer. In 1901 he became assistant engineer to the Folkestone Electricity Supply Co., Ltd., and in the following year was appointed engineer and manager at Hythe for that company. He became engineer and manager of the Melton Mowbray Electric Light Co., Ltd., in 1905, and was appointed to a similar position with the Urban Electric Supply Co., Ltd., at Dorking and Caterham in 1907. From 1910 until the outbreak of the last war he was engineer and manager for the Urban Electric Supply Co. at Hawick, and during the war held a commission in the Tyne Electrical Engineers. Early in 1919 he commenced his present business in Wolverhampton as the Midland Electric Installation Co., and turned it into a limited company in 1931.

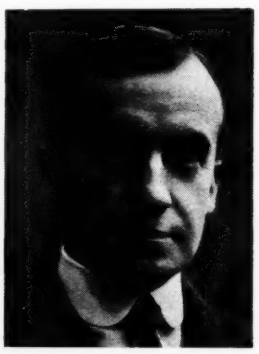
Prof. B. P. Haigh, who last week delivered the eighth Andrew Laing lecture before the North East Coast Institution of Engineers and Shipbuilders on "Electric Welding as an Integral Part of Structural Design" (reported elsewhere in this issue), is a Glasgow graduate (1904). He served his time as an engineer and gained several years' practical experience before he returned to academic life, first as an assistant to Prof. A. Barr in Glasgow, and later (since 1913) in the Royal Naval College, Greenwich, where in 1921 he succeeded Sir James Henderson as Professor of Applied Mechanics. Prof. Haigh has made important investigations of vibration fatigue and corrosion-fatigue, and in 1910 he designed the testing machine with which his name is associated.

At a recent meeting of the Hull Corporation Electricity Committee the town clerk reported that the agreement under which **Mr. D. Bellamy** consented to remain in the service of the Electricity Department for a period of five years expired on September 28th. It was agreed that, subject to the general manager entering into an agreement to remain with the Corporation for a further period of five years, the minimum scale of salaries agreed by the I.M.E.A. and the A.M.E.E. for chief electrical engineers of authorised electricity supply undertakings should be applied to the position held by Mr. Bellamy on the basis of the undertaking having an annual sale of not more than 100,000,000 kWh, and so that the maximum of the scale should be reached by equal annual instalments.

Mr. J. A. B. Horsley who, as we announced in our last issue, has retired from the position of H.M. Electrical Inspector of Mines has served in that capacity for twenty years. He received his education at Dover College and served his engineering apprenticeship at Manchester, following which he was engaged for over four years in electrical work in the gold mines of the Transvaal, where he was responsible for the



Mr. J. A. B. Horsley



Mr. G. M. Harvey

erection of one of the earlier three-phase mine installations. Returning to England in 1899, he joined the staff of the late Mr. R. Hammond, consulting engineer, and carried out a considerable amount of municipal and company electricity supply work. Mr. Horsley joined the Navy in 1916, serving in a technical capacity in H.M.S. *Inflexible*. He was appointed H.M. Electrical Inspector of Mines in 1919. Mr. Horsley is a member of the I.E.E. and received the O.B.E. in 1930. He served as president of the Association of Mining Electrical Engineers in 1937-38.

Mr. G. M. Harvey, who succeeds Mr. Horsley as H.M. Electrical Inspector of Mines, was special lecturer in Mining Electrical Engineering at the University of Birmingham from 1920 to 1930, and in the latter year was appointed H.M. Deputy Electrical Inspector of Mines. He was president of the Association of Mining Electrical Engineers for 1927-28, and is the author of two textbooks entitled "Colliery Electrical Engineering," and "Electrical Engineering for Mining Students."

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Economic Transmission

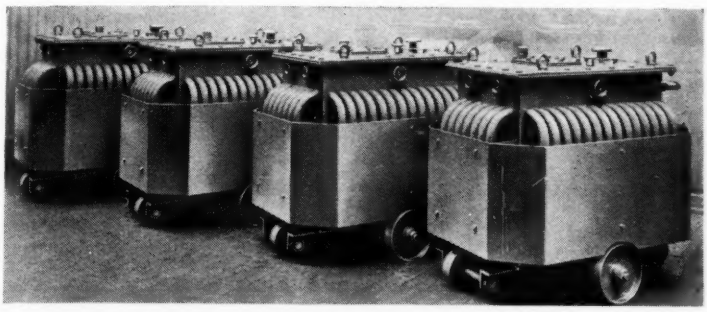
CAN an impracticable transmission be called economic? Many years ago one lamp was lit, during a meeting, in New York City with power generated at Niagara Falls, for a short period only, using telegraph wires for the transmission and measuring the voltage delivered before selecting the lamp—three hundred miles and a very few watts. Nothing has been heard by me of any subsequent suggestion of Niagara Power reaching New York. In his letter in your issue of November 3rd, Mr. A. M. Taylor gives no load factor in connection with the 2,400-mile transmission scheme which he mentions.

Dr. Alexander Russell, referring in the "Faraday House Journal" to hydraulic plant for Niagara Falls in 1887 (I think he meant Niagara County, since I believe 1903 was the date of the first 169-ft. head plant of the Niagara Falls Power Co.) emphasised the great importance of only building up plant as the load develops. If this is not done, he said, the undertaking is doomed to failure financially.

A plant was illustrated in *World's Work* of 500,000 HP installed at Matanzas, fifty miles east of Havana, which absorbed 60 per cent. of the output in pumping water. I never could learn of any demand for the balance of 200,000 HP in Cuba and in that case, granted that the power was available for practically no cost except capital charges, can the word economic be applied to it?

I was once informed on responsible authority that 400,000 HP could be developed and delivered to every village in Scotland at a selling price of 0.25d. per kWh (a continuous demand for 24 hours a day had been assumed) yet a considerable portion of that available power is still undeveloped. It was shown that (unless a free transmission line were provided) a continuous 10,000-kW demand at, say, Dundee, would be necessary to produce power at a price to compete with Norway's water power for a twenty-four hour chemical load.

Herne Bay, *November 6th.* THEODORE STEVENS.



English Electric 600-A portable arc-welding equipments

Heavy-current Welding Equipment

With reference to the paragraph and illustration which appeared on page 592 in the ELECTRICAL REVIEW of November 3rd, referring to AC arc welding equipments developed by Messrs. Bonar, Long & Company, Ltd., we would point out that the English Electric Company, who are manufacturers of all sizes of AC arc-welding equipment, do not agree that the equipment illustrated in the article is the highest output plant so far manufactured in this country.

For instance, in 1936 we supplied several 600-A per operator AC equipments, and other similar equipments have since been supplied to customers. In addition, we have made single-operator AC welding regulators, each having a capacity for normal welding at 1,000 A.

We have supplied many large output plants and have manufactured and supplied transformers capable of supplying welding regulators with a capacity up to 2,400 A per phase.

The accompany photograph illustrates a group of 600A AC arc-welding portable units referred to in the second paragraph. These have been in service for more than three years.

M. B. SCHROEDER,
For Manager, Publicity Department.

Stafford, *November 10th.* ENGLISH ELECTRIC CO., LTD.

In the article which appeared in your November 3rd issue describing AC arc-welding equipment manufactured by Messrs. Bonar Long & Co., Ltd., a statement was made that a three operator AC arc-welding set with an output of 600 A per operator was claimed to be the highest output plant so far manufactured in this country.

We should be grateful if you would note that the Quasi-Arc Co., Ltd., has been supplying transformer welding equipment of similar type for about twenty years and in 1933 we supplied a transformer unit for three operators generally similar to that described in the article for an output of 600 A per welder.

QUASI-ARC CO., LTD.,
A. E. VILLIERS (*Chief Electrical Engineer*).

London, S.W.1, *November 11th.*

Personal (*concluded from preceding page*)

He holds the degrees of B.Eng. of Liverpool University and M.Sc. of Birmingham University, and is an associate member of the I.E.E.

Mr. S. A. Millington, general manager of J. H. Tucker & Co., Ltd., has been appointed a director, filling the vacancy on the board created by the retirement of **Mr. C. F. J. Tranter,** J.P., whose association with the company began over forty years ago, soon after the late Mr. J. H. Tucker commenced business.

Mr. F. W. Purse, M.I.E.E., M.I.Mech.E., chairman of the Transmission Section of the Institution of Electrical Engineers, whose address to that Section is summarised in this issue, is well known in the electrical industry as chief engineer of the London and Home Counties Joint Electricity Authority. Born in Bristol, he was educated at the Merchant Venturers' Technical College (now University of Bristol) and University College (evening classes), and he obtained junior and senior scholarships of the City of Bristol. He also holds many certificates in allied engineering subjects, including the honours diploma of the City and Guilds in electric light and power distribution. Mr. Purse has had thirty-two years of continuous municipal service, commencing with the Bristol Corporation Electricity Department in 1897, and subsequently holding appointments at Bath, Warrington, Watford, Carlisle and West Ham; at the last three towns he held the position of chief electrical engineer. He took up his present appointment in 1929. He is associated with numerous electrical bodies, on many of which he has served as president or vice-president, and among his many present activities he is a member of the Council and Executive Committee of E.D.A. He is also a member of various I.E.E. and B.S.I. Committees. He is a past vice-president and member of the Council of the I.E.E., and has been president of the I.M.E.A. He has written numerous papers and articles on public electricity supply matters. In the last war he was captain, 1st Volunteer Battalion, Border Regiment, chairman of the Carlisle Area Road Transport Committee, member of the East Cumberland Munitions Committee and Management Committee of the Carlisle National Shell Factory, and District Engineer, Coal Department of the Board of Trade.

Mr. A. Mullins, C.M.G., C.B.E., Deputy Comptroller-General of the Department of Overseas Trade, who since the outbreak of hostilities has held the appointment of Principal Officer to the Midland Region (Civil Defence), has now been recalled and appointed Acting Comptroller-General of the Department of Overseas Trade.

Mr. J. E. Macfarlane, senior lecturer in electrical engineering at the Northampton Polytechnic, London, E.C., has been appointed head of the Department of Electrical Engineering at Liverpool Technical College in place of **Mr. J. Cormack,** who has been appointed headmaster of Bootle Technical College.

Mr. G. A. Pemberton has assumed the managership of the Manchester branch of Brown Brothers, Ltd., vice **Mr. E. S. Brown,** who has been serving as a pilot officer since the outbreak of hostilities. Mr. Pemberton has been with the company for a number of years and has held the successive appointments of manager of branches at Dublin, Leeds and Southampton. He is succeeded at Southampton by **Mr. W. L. Rutter** who, after some years at the company's Liverpool branch, was recently attached to the head office sales staff.

Wills.—Mr. Sydney Evershed, late chairman of Evershed & Vignoles, Ltd., left £67,395 with net personalty £64,794.

Mr. V. S. Woods, chairman of the Ransome & Marles Bearing Co., Ltd., left £25,433 (net personalty £23,701).

PARLIAMENTARY NEWS

By Our Special Reporter

Electric Torches

IN the House of Commons last week Sir P. Hurd asked the President of the Board of Trade whether he was bringing under expert examination the explanation given by wholesale dealers in electric torches and batteries for the steep rise in prices; whether British manufacturers were being brought within the scope of his inquiries; and whether he would ensure a fair rationing to retailers, large and small, of such supplies of batteries as were available.

Mr. Oliver Stanley said that the Board of Trade had no facilities for a detailed investigation of the wholesale trade in torches and batteries, but the question of applying the Prices of Goods Bill to these goods would have to be considered when that Bill became law. He had been in communication with the chief British manufacturers. They had not increased their prices until the previous day, when certain increases were made as a result, he was informed, of the increased cost of materials. He understood that manufacturers were allocating available supplies as equitably as possible to their regular wholesale and retail customers.

Two-part Tariffs

Sir W. Davison asked the Minister of Transport whether he was aware that many householders in evacuation areas were obliged to continue lump-sum payments in respect of electricity supply to premises, notwithstanding that they had vacated the premises in question and were not using any electricity; and whether steps would be taken to enable any such agreements to be terminated at short notice.

Capt. Wallace said that two-part tariff agreements involving payment of a fixed or service charge per quarter, plus a charge for the units of electricity actually consumed, were usually terminable on three months' notice and he had no jurisdiction to intervene.

Fuel Rationing Consultations

On November 7th Mr. Dunn asked the Secretary for Mines what consultations took place to ascertain public opinion prior to introducing the coal rationing scheme, including all parties in the coal trade and if he had tested the same opinion since the scheme had been in force and with what results.

Mr. G. Lloyd said that the arrangements for rationing coal, gas and electricity were prepared in close consultation with representatives of the interests affected, including the Coal Merchants' Federation, the Co-operative Societies, the National Gas Council and the Electricity Commission. This contact had since been maintained.

Sir Cyril Hurcomb's Appointment

On November 8th Mr. T. Smith asked the Minister of Transport whether he had appointed a successor to Sir Cyril Hurcomb at the Electricity Commission, in view of his appointment as Director-General of the Ministry of Shipping.

Captain Wallace said he had not. Arrangements had been made under which Sir Cyril Hurcomb would continue to hold his appointment as chairman of the Electricity Commission on conditions which would leave him free to carry out fully his duties at the Ministry of Shipping.

Mr. Shinwell asked if Sir Cyril Hurcomb would receive a salary as director-general of the Ministry of Shipping. Capt. Wallace said that there would be the proper adjustment of salary between the two jobs.

Mr. Chuter Ede asked if the Minister did not think that the job at the Electricity Commission at the present time demanded full time duties? Capt. Wallace replied he had consulted the electricity supply industry and at least two prominent members of the party opposite. They believed that it was in the best interests of the industry that Sir Cyril Hurcomb should remain titular chairman of the Electricity Commission.

The matter was raised again on Tuesday last when Sir D. Somervell, the Attorney-General, moved the second reading of the Chartered and Other Bodies (Temporary Provisions) Bill, the general purpose of which, he said, was to enable modifications to be made in the constitution and electoral procedure of bodies incorporated under Royal Charter, statutory bodies and universities and colleges, if such modification became necessary to meet war conditions. The schedule included the case of the Electricity Commissioners. Under the Electricity (Supply) Act, 1919, there had to be three whole-time commissioners and there could also be two part-time commissioners. One of the whole-time commissioners was recently appointed to a position under the Ministry of Shipping. It was desired to reduce the number of whole-time commissioners to two and to retain the services of that gentleman as a part-time commissioner in order that the Commission might have the benefit of his experience when required. Those responsible were satisfied that under wartime conditions two whole-time commissioners and one part-time commissioner could do the work adequately.

Mr. Dalton, for the Labour Party, said that some members of the House were a little disturbed about the proposals by which the same gentleman could be Director-General of the Ministry of Shipping and also the active chairman of the Electricity Commissioners. He did not consider that these two important tasks could be effectively done by one man, however able, and they all believed Sir Cyril Hurcomb to be an able man.

Mr. Chuter Ede said it ought to be brought to the notice of the Minister of Transport that difficulty would inevitably arise if there were only two electricity commissioners actually functioning. During the chairman's absence the commissioners should be reinforced by some other person.

The Bill was read a second time.

Loans for Scottish Undertakings

Mr. Gibson asked the Minister of Transport, how many of the 139 loans, amounting to £4,394,365, granted by the Electricity Commissioners during September and October, were for undertakings in Scotland; and what was the corresponding amount.

Capt. Wallace said that four loan sanctions, amounting to £15,896, were granted to public authority undertakings in Scotland during the period mentioned.

Coal Ration Increased

On November 9th Mr. Geoffrey Lloyd said that the reasons for rationing coal used for domestic and similar purposes were —first, to conserve stocks of coal already distributed throughout the country against the possible dislocation of sea and rail communications by enemy action; secondly, to make more coal available for export as a means of securing foreign exchange.

As the position was at present satisfactory, the Government felt that relying upon the public to exercise economy it could make a relaxation in regard to coal rationing, and had decided to raise the percentage under the coal rationing scheme from 75 to 100 per cent. of last year's consumption. In order to enable the reduced percentage under the rationing scheme to be made effective at short notice, if it should prove necessary, it was intended to complete registration and the fixing of the basic quantities of the consumers of coal, gas and electricity. This work will, it was hoped, be completed in a few weeks and it would then be possible, if the position remained as at present, to close many of the local fuel offices and retain only a skeleton staff.

Unemployed Electricians

Mr. Thurtle asked the Minister of Labour whether he was aware that in the London area alone upwards of 500 skilled electricians, many of whom held key positions in the industry, were unemployed with very little prospect of finding work; and, in view of the large number of skilled and unskilled men connected with the electrical industry whose unemployment was partly due to the ban on capital expenditure, what action he proposed to take in the matter.

Mr. E. Brown said if the hon. member had any specific cases in mind he would gladly inquire into them.

Electricity Undertakings

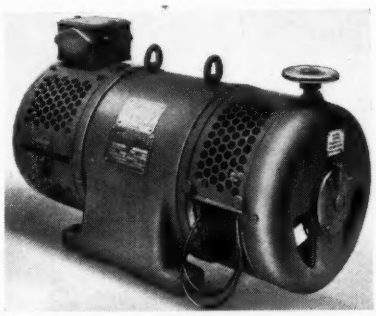
In reply to Mr. Chater, Sir D. Somervell said he was not aware of any ground for the suggestion that certain gas, water and electricity undertakings were withdrawing supplies as a means of evading the provision of the Courts (Emergency Powers) Act. The right of such undertakings to cut off supplies was conferred by statute, but any proceedings for recovery of amounts due in respect of supplies already obtained by the consumer were subject to the restrictions imposed by the Courts (Emergency Powers) Act. The general principle as to appropriation of payments was that the debtor had a right to appropriate, but if he could not do so the right passed to the creditor. As at present advised, he had no reason to think that any legislation restricting the existing rights of gas, water or electricity undertakings to withdraw supplies would be justified. If the hon. member had any specific cases which he thought ought to be investigated he should refer them to the appropriate Department.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Small AC Commutator Motor

OWING to the large demand for Schrage type polyphase variable-speed commutator motors of sizes around 5 HP, the BRITISH THOMSON-HOUSTON CO., LTD., has developed a still smaller motor, the "CHT 3817" 4-pole machine. It has a maximum rating of 4 HP, with a speed range not exceeding 2,050/683 RPM. When rated at 3 HP any speed can be obtained between 2,500 RPM and zero. The motor weighs 265 lb. and measures 29⅜ in. long, 13 in. wide and 15⅛ in. high. It is made in various ratings for three-phase, 50 cycle, 400/440-V circuits.

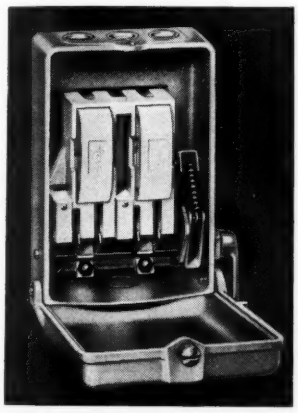


Small B.T.H. variable-speed AC commutator motor

This machine should prove extremely valuable for small power drives for conveyors, baking machinery, textile machinery, pumps, small printing presses, &c., and its small size should make it easy to accommodate even where space is severely restricted. No auxiliary apparatus is needed other than a switch to connect it to the supply. The speed variation is obtained by merely turning the brushgear spindle.

Switch and Fusegear Development

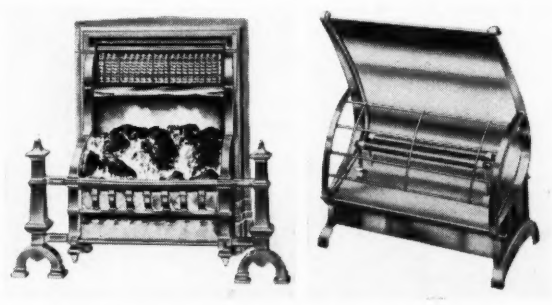
There has recently been an increasing demand for high-rupturing-capacity fuses on domestic and industrial lighting circuits where potential fault currents of high value make their installation desirable. Accordingly, WM. SANDERS & CO. (WEDNESBURY), LTD., Falcon Electrical Works, Wednesbury, Staffs, have placed on the market a complete range of domestic and industrial switchgear equipped with the "Sandalite" duplex fuse which is suitable for either ordinary or h.r.c. duty, according to which of the two interchangeable carriers is employed. In the "C.L." type of carrier, the cartridge link itself forms the carrier tongues. Consequently connection cannot be made by means of hairpins and other devices.



"Sandalite" combined switch and fuse

New Premier Fires

Of five fires introduced this season by PREMIER ELECTRIC HEATERS, LTD., Keeley Street, Birmingham, three are of the reflector type. The largest of these, the "Paranova," is a 3-kW unit of graceful design with substantial cast sides and a large parabolic reflector of solid brass, chromium plated. Three-heat control is provided by switches at the side.



"Cotswold" and "Parabeau" fires.

This model, like the somewhat similar 2-kW "Parabeau," is available in sprayed or antique silver or gold finishes, while the attractive little "Parabon" loaded at 1-kW is stocked in pastel cream, green and blue. Rod-type elements are fitted.

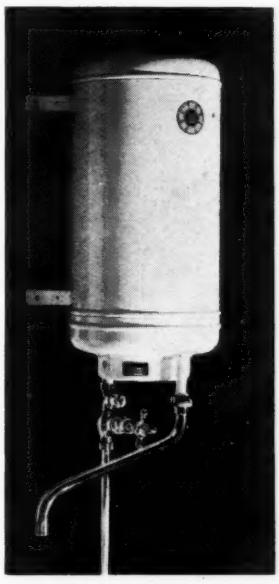
A light cast construction is used for the portable "Broadcaster" fire which is fitted with 2-kW fire-bar elements of large radius ensuring heat distribution over a wide area. It is available in cream, green and pink vitreous enamel. The fifth fire, the "Cotswold," is a realistic imitation coal model. The curved fire-bar loaded at 2¼ kW is in three sections.

Water-heating Apparatus

Three new types of water-heaters have been brought out by THERMICS, LTD., 392, Euston Road, London, N.W.1. One is a combined bath and basin set, a neat and compact equipment occupying much less space than the usual arrangements. Suitable for AC supplies only, it is thermostatically controlled and has a capacity of 25 gal. It is supplied ready for use, complete with cistern, chromium-plated fittings, switch and fuses.

A 1½-gal. sink heater, specially designed to facilitate maintenance and reduce external dimensions is another new unit. It is finished in white enamel with chromium-plated fittings, and with an exceptionally easily cleaned interior. The loading is 850 W.

The third heater is a dual-purpose unit intended for supplying small flats, housing estates, etc., and consists of a small lagged heater (which supplies hot water for the sink and lavatory basins), situated inside a large container capable of supplying hot water for a bath when required. As it also contains its own cold-water tank, it can be connected with the main water supply. The 3-kW element is thermostatically controlled. The apparatus projects only 14½ in. from the wall, and measures 30 in. high by 15½ in. wide.



Standard thermostatically controlled self-contained Thermics water heater

Picture-rail Brackets

In these days, or rather nights, of black-out few lighting fittings are likely to prove of more value for local lighting in houses than the new brackets just introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, for hanging on a picture rail. The arm can be raised or lowered as required and be used for either inverted or drop shades.

Two types are available, the main difference being the design of the 4-ft. suspension rod. Chromium plate or antique brass are the standard finishes and several different types of shade are available including an 11-in. diam. art vellum design, giving both direct and diffused light.

G.E.C. picture-rail bracket

Flexible Pipe Union

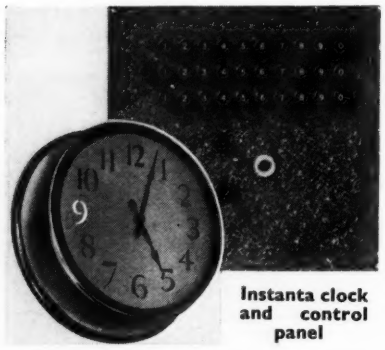
The outstanding feature of the "Clayflex" patented flexible pipe union introduced by HOWARD CLAYTON-WRIGHT, LTD., Tiddington Road, Stratford-on-Avon, is that, while the two screwed unions are of normal design, a special synthetic rubber gasket is used. This is threaded over the end of the pipe to be connected, and when the union nut is tightened, is compressed and automatically flares the pipe, at the same time forming a positive joint which is flexible and leak-proof. The pipe is not in metallic contact with the union, since it is held and supported by the union.

A.R.P. EQUIPMENT

Special Apparatus Designed to Meet Present Needs

Personnel Location

WARTIME conditions bring with them new applications of the "Instasig" combined personnel location and electric clock system developed by INSTANTA ELECTRIC, LTD., Aldersgate Chambers, 9, Goswell Road, London, E.C.1. Apart from the especial importance now of securing rapid contact between factory, office, hospital, &c., staff and, incidentally, having accurate time throughout the building, the system is already proving its value for giving preliminary warnings to A.R.P. officers without giving a general alarm. In the same way warnings of fires, &c., can also be given, and in the case of large stores, of shop-lifters and pick-pockets too.



Instanta clock and control panel

Under the scheme individuals are allotted numbers and when anyone is required the telephone operator, commissionaire, &c., depresses the appropriate key on the automatic repeater control panel. The number signalled immediately appears simultaneously illuminated on the hour numerals of every clock dial throughout the premises. The signal continues intermittently until the individual is located, and it is then cancelled by depressing the reset key. Generally the flashing signal is considered sufficient, but if required an audible signal can be included.

Although there is no limit to the number of different signals that the company is prepared to provide, the standard schemes cater for 21, 39, 84, 255 and 1,110 individual signals. The use generally of only a few of the numerals (four are, for example, used for the 84-signal scheme), coupled with the fact that one-, two- or three-number calls can be transmitted, greatly simplifies wiring.

Special automatic repeater control panels are available for sending out two or more signals simultaneously, one model sending out up to 16 different signals in a minute. In fact, the company claims that there is no problem of staff location or numerical signalling which it cannot solve, and an advisory service and portable demonstration outfits are available for the convenience of both prospective users and electrical contractors. Incidentally, the company is the manufacturer of the "F.B.M." parallel half-minute silent impulse timekeeping system.

Chest Lamps

The present difficulty of obtaining dry batteries, as well as the question of maintenance cost and convenience, renders particularly welcome the introduction, by CEAG, LTD., Windsor House, Victoria Street, London, S.W.1, of two chest lamps, complying with BS/ARP/3, one with a rechargeable lead-acid battery (the "Jellac") and the other with a rechargeable alkaline battery (the "Superlite 2").

"Jellac" chest lamp

The former model employs a 2-V unspillable jelly acid battery with low-consumption bulb and provides a good light for 15 hours' continuous use. The battery, which has a life of 9-12 months before plate renewal is required, is housed in a cast-aluminium case and the lantern itself is a thick bakelite moulding. The lamp is waterproof and is fitted with a diffusing glass toughened to withstand mechanical shock. A carefully designed cowl, in conjunction with the diffusing glass, directs the light downwards and forwards.

The "Superlite 2" lamp, which is similar in general design, incorporates an alkaline battery with tubular positive electrodes giving a capacity of 18 hours' continuous use. This lamp can be left standing for any length of time without damage to the battery, which has a normal life of six years. The case is constructed of stainless steel. Both lamps are arranged for attaching to the chest by means of a light webbing harness so leaving both hands free. The use of bulbs with two filaments (each with a rated life of 300 hours) ensures that should one filament fail the other can be brought into operation without delay by turning a three-way switch.

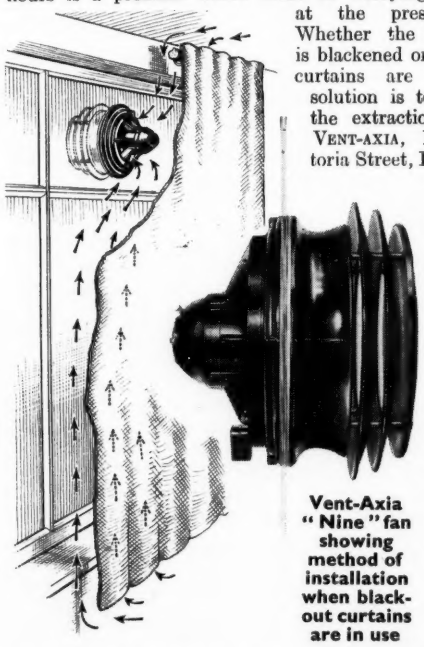
Lamp Shields

A special range of telescopic lamp shields for use with existing parchment or silk shades is now obtainable from BEST & LLOYD, LTD., Cambray Works, Handsworth, Birmingham. The fitting consists of three telescopic sections, the opening of the bottom section being reduced by a screen. The amount of light emitted and its spread can be regulated by adjusting the position of the various sections. Four different sizes are available, the A.R.P. 5, 6, 7 and 8, housing respectively lamps of 60, 100, 150 and 200 W. The shields are made of spun aluminium finished in black or ivory cellulose outside and black inside.

Best & Lloyd "A.R.P." shield

Ventilation During Black-out

The provision of adequate ventilation during black-out hours is a problem which must be worrying many people at the present moment. Whether the window glass is blackened or whether dark curtains are employed, a solution is to be found in the extraction fans which VENT-AXIA, LTD., 9, Victoria Street, London, S.W.1, makes for fixing on to the window glass. Installation presents no difficulties, and the company can even arrange for cutting the necessary hole in the glass. If curtains are fitted, they should be hung 6 in. to 8 in. from the glass.



Vent-Axia "Nine" fan showing method of installation when black-out curtains are in use

Factories, offices, restaurants and public-houses are places where the fans are especially applicable, though the cost is sufficiently low to induce many householders to install them in their own homes. Arranged for intake instead of extraction, the fans are also being used largely for air-raid shelters and trenches.

Two models are made—the "Six," extracting 8,000 cu. ft. of air per hour, and the "Nine," dealing with 20,000 cu. ft. and having three speeds. Electricity consumption is insignificant, being only 25 and 35W respectively. Brown bakelite is the standard finish, but cream is also available.

CANADIAN INDUSTRY AND TRADE

Growth of Non-ferrous Metal Production

WITHIN the past decade there has been a transformation in the economic structure of Canada from a predominantly agricultural country to one in which the manufacturing and mining industries are playing a more and more important part. Agriculture still supports about one-third of the population but successive droughts in the prairies and increasing difficulty in finding export markets for wheat have undermined agriculture's former supremacy. The gradual development of Canada's vast mineral resources has been the principal source of the country's economic vitality in recent years and this has led to important extensions in the field of industry. According to gross value of production, non-ferrous smelting and refining was tenth among Canadian industries in 1929, and is now the most important of all, with production valued at over $318 millions in 1937.

The general tenor of the report to the Department of Overseas Trade by Mr. A. R. Bruce, Assistant to H.M. Senior Trade Commissioner in Canada and Newfoundland (Mr. A. M. Wiseman, M.C.) on economic and commercial conditions in Canada (Stationery Office, 2s. 6d. net), is to emphasise the increasingly competitive nature of the market for completely manufactured goods.

The exports of non-ferrous metals and their products in 1938 were valued at $255¼ millions, while exports of newsprint, wood pulp and pulpwood combined totalled $146 millions. These two groups together accounted for nearly 44 per cent. of the total exports of domestic produce in that year. There was a decline in manufacturing production of nearly 13 per cent. and the falling-off in activity in several important industries such as newsprint and iron and steel production was even greater. The output of the mining industry advanced to a new high level, but the gain was not sufficient to offset the decline in base metal prices. The first five months of 1939 brought some improvement in economic conditions as compared with the corresponding period in 1938. The index of the physical volume of business increased 4.3 per cent., while there was a rise of 10.5 per cent. in exports. Mineral production increased by 10 per cent. and manufacturing production by 5.2 per cent.

Manufacturing Industries

The gross value of the products of the manufacturing industries in 1937 was estimated at $3,623 millions, an increase of 20.7 per cent. over the previous year, but still 6.7 per cent. below the 1929 level. The incidence of the depression resulted in a rearrangement in the rank of many industries. The decreased expenditure for capital goods greatly reduced the output of such important industries as sawmills, electrical equipment, primary iron and steel, and machinery. In 1938 manufacturing production declined 12.9 per cent. from the high level of the previous year, but as, already stated, since the beginning of 1939 there have been some signs of improvement.

Production by firms in the electrical apparatus and supplies industry was valued at $98.8 millions in 1937, an output value that has only been exceeded in the record years of 1929 and 1930 when the totals were $113.7 and $104.5 millions respectively. Although there were 191 firms in operation in 1937, a large number of these were small and twenty firms were responsible for nearly 68 per cent. of the total value of production. The capital represented by this industry was $97.1 millions and afforded work for 21,706 employees. In the accompanying table some of the principal products in 1937 are given :—

	Gross selling value at works $
Wires and cables, except aluminium	15,091,629
Radio sets and parts (except valves and transformers)	13,224,740
Motors, AC and DC, and parts	7,672,278
Electric refrigerators	6,661,764
Batteries and parts	6,608,914
Telephone material (telephones, switchboards, etc.)	6,199,096
Transformers and parts	5,624,512
Incandescent lamps—standard size	4,477,267
Motor-driven appliances (vacuum cleaners, fans, washing machines, clocks, etc.)	3,142,271
Lighting fixtures	1,973,584
Radio receiving valves	1,760,109
Conduit and fittings	1,576,022
Switchboard panels and equipment	1,434,807
Generators, AC and DC, and parts	1,314,403

Exports of electrical apparatus fell from $4,429,000 in 1937-38 to $3,864,000 in 1938-39, shipments to the United Kingdom decreasing from $1,019,000 to $596,000 and those to the United States from $36,000 to $32,000.

At the beginning of 1939 the developed water power in Canada totalled 8,190,772 HP representing 98 per cent. of the total electricity produced. Of this over 4,000,000 HP was developed in the Province of Quebec and over 2½ million HP in the Province of Ontario. The turbine installation in central electric stations developing power for sale totalled 7,202,259 HP or 87.9 per cent. of the total Canadian turbine installation. Water power developed by pulp and paper companies amounted to 646,901 HP or 7.9 per cent. of the total. In addition, pulp and paper companies have motor equipment for operation by purchased hydro-electricity aggregating more than 1,200,000 HP, making a total of more than 1,846,000 HP.

Large amounts of electricity are also purchased for use in electric boilers the estimate for this purpose being more than 1¾ million HP. Water power developed in connection with industries other than the central electric stations and the pulp and paper industries accounts for the remaining 4.2 per cent. of the total Canadian installation. More than 800,000 HP is generated or purchased by the mining companies.

According to the latest figures available (those for the calendar year 1937) central stations generated a total of 27,688 million kWh, and the net distribution was 25,846 million kWh. Of this 7.8 per cent. was sold for farm and domestic use, 3.7 per cent. for commercial lighting, 2 per cent. for small power use (less than 50 kW per customer), 76.7 per cent. for large power purposes (more than 50 kW per customer), and ¾ of 1 per cent. for street lighting. As a result of the reduced power demand no large hydraulic plants were placed under construction in the period between 1931 and 1937, but in 1938 construction commenced on the St. Maurice Power Corporation's new station of 243,000 HP at La Tuque on St. Maurice River and other companies are making smaller additions.

Electrical Imports

The United States continues to enjoy the bulk of the import trade in electrical apparatus, n.o.p., and lamps and fixtures, its share of the total of $12.5 millions in the year ended March, 1939, being $10.1 millions. Imports from the United Kingdom declined from $2.1 millions in 1937-38 to $1.8 millions in 1938-39. Details are given below :—

	(In thousands of dollars)					
	Total Imports		Imports from United Kingdom		Imports from United States	
	1937–8	1938–9	1937–8	1938–9	1937–8	1938–9
Storage batteries and parts	160	92	100	7	59	85
Dynamos, generators and parts	769	506	186	96	491	313
Electric light fixtures	799	803	26	25	715	727
Incandescent lamps	268	252	9	6	121	143
Motors and parts	2,398	1,795	463	307	1,899	1,394
Switches, etc.	916	587	115	120	663	440
Telephones and parts	1,019	795	77	131	941	660
Transformers	422	251	206	137	99	85
Wireless valves	230	279	9	1	221	278
Wireless apparatus, n.o.p.	2,486	2,082	190	188	2,294	1,894

Mr. Bruce states that the Canadian market is a difficult one for United Kingdom electrical apparatus manufacturers, partly because of the large productive capacity of the local manufacturers, many of whom are associated with well-known United States firms, and partly because standard equipment is similar to that used in the United States. An example of standardisation can be cited in the case of electric motors. The National Electrical Manufacturers' Association of the United States has standardised induction motor dimensions up to 75 HP. This standard fixes all dimensions such as mounting holes, shaft height and size, &c., and numerous firms will only purchase N.E.M.A. standard motors so that they will be interchangeable.

The virtual elimination of imports of storage batteries and parts from the United Kingdom last year was due to the fact that importers had large stocks left on their hands after making bulk purchases in 1937. These stocks have gradually been used and it is anticipated that imports in 1939 will be on a more normal basis. It must be borne in mind, however, that the report was prepared before the outbreak of war.

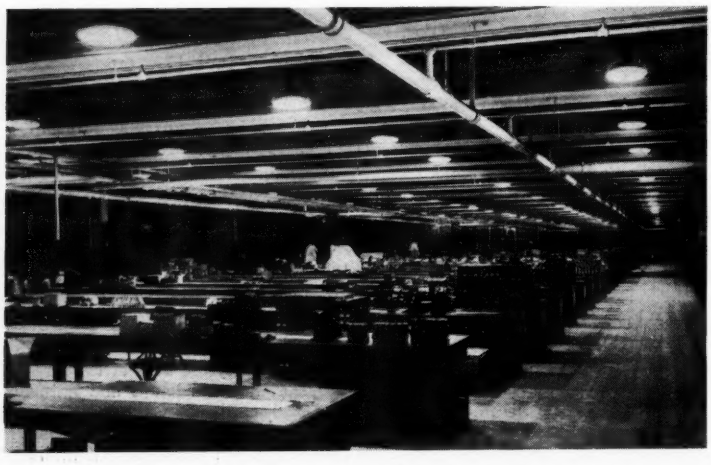
Mr. Bruce once again emphasises that in the case of equipment such as dynamos, generators, transformers, motors, switches, &c., it is essential that United Kingdom manufacturers should have organisations in Canada capable of servicing equipment of this type, and he repeats the warning given in his last report that considerable harm to United Kingdom trade in these lines has been caused owing to the taking by United Kingdom firms of a few orders when representatives have visited Canada or owing to the appointment of a selling agent only, with subsequent failure to give adequate service.

COMMERCIAL and INDUSTRIAL NEWS

Erith Showrooms Opened. Factory Lighting Installation. F.B.I. and War Risks Insurance. British Trade with India.

Erith's New Showrooms

THE Erith Corporation Electricity Department's new showrooms and offices, described in last week's issue of the ELECTRICAL REVIEW (page 615), were inaugurated last Saturday by the Mayor, Councillor C. F. Morling. Opening the proceedings, the chairman of the Electricity Committee, Councillor G. W. H. Luck said that but for the war the opening of the premises would have heralded an intensification of the campaign of domestic development, on which the town had always prided itself. Erith was fortunate in that it had always had what was now the standard AC system of supply and also in having a good mixture of industrial and domestic consumers. It was now one of the most intensely developed areas in the country and its figure of 768 kWh sold per head of the population was the second best in the London area.



Benjamin reflectors in the new factory of Boots Pure Drug Co., Ltd., at Nottingham

In recent years the greatest development had been in relation to cooking, and there was now one house in every three in Erith with an electric cooker. The grid was generally regarded as one of the major successes of rationalisation, but it was probable that the future would show that there was no need for a reorganisation of the distribution side of the electricity supply industry. Since 1935 the price of coal had increased by 60 per cent., but due to improvements in generation efficiency this had not resulted in an increase of price to consumers generally. This state of affairs could not continue indefinitely. With regard to future developments, Councillor Luck suggested that Erith, by virtue of its undeveloped frontage on the Thames, offered an ideal site for the erection of a grid generating station. He regretted that the late Alderman Humphreys, former chairman of the Electricity Committee, who had played such a large part in the development of the undertaking, had not lived to see the opening of the showrooms.

Performing the opening ceremony, the Mayor said that they could congratulate themselves in these days of strife that they were doing something constructive and not destructive. The hall of the showrooms would in some way act as a civic centre. He added that they were fortunate in having as their engineer and manager Mr. E. A. Logan.

Australian Duty on Radio Valves

An amendment to the Tariff Schedule fixing similar rates of duty on radio valves under the intermediate tariff as under the general tariff before May, 1938, was recently introduced by the Australian Minister for Trade and Customs (Mr. Lawson) in the House of Representatives, states our Perth Correspondent. Although the intermediate tariff was not at present operating, said Mr. Lawson, the Government did not propose to reduce existing duties because it could not forgo the revenue which, with importations of about 500,000 valves a year, was more than £86,000.

Radio for Export

It is very satisfactory to hear from the General Electric Co., Ltd., that in the matter of radio sets, at least, export trade continues good. There are various factors operating in favour of British manufacturers, one being that leading concerns are doing their utmost to meet the special requirements of overseas markets. The G.E.C. itself has collected a great deal of data from engineers at its branches in all parts of the world which has enabled it to produce suitable designs. Tropical conditions require particular study and the company has installed testing plant simulating very humid atmospheres to ensure that the electrical and physical characteristics of materials used do not suffer from climatic conditions. Similarly there are "pinhole" tests for enamelled wire, life tests (most important where service facilities may not be easily available), examination of the seasoning of timber, and many others. This special work is, of course, additional to the usual tests applied to all receivers whether intended for home or overseas use.

Factory Lighting Installation

When Boots Pure Drug Co., Ltd., completed a new factory building at Nottingham recently it realised the need for good lighting planned according to the needs of the operations in various parts of the building. The accompanying illustration shows a part of the packeting hall in which 195 Benjamin "Saaflux R.L.M." reflectors are installed with 200-W lamps and the light is very well distributed over the benches along which conveyors run enabling the goods to be handled easily and quickly. In the whole building there are over 3,000 reflectors providing illumination ranging from 5 to 16 ft.-candles, depending upon the class of work.

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted:—H. G. Jones, Bath; Wm. Anderson, Barrhead, nr. Glasgow; and Charlton Electrical Co., Ltd., 262/3, Empire House, St. Martins-le-Grand. London, E.C.1.

At the same meeting one application was withdrawn and two were declined.

Marking of Imports into Canada

The Canadian Commissioner of Customs announces that an additional regulation has been made relative to the marking of articles wholly of porcelain for electrical use imported into Canada. This provides that articles of porcelain made for the purpose of being united with other materials so as to form a composite article, as well as small porcelain beads used by electricians, may be marked on the first covering or container in which they are imported.

Christmas Suggestions

It is difficult, perhaps, under existing conditions to realise that Christmas is but a few weeks ahead. While the full peace-time festivities may be missing, the custom of buying gifts is one which not even a war can stop. Already many stores are beginning to assume a festive appearance, and electrical showrooms are playing their part. Consumers of the Northmet Power Co. are reminded of the usefulness of electrical gifts by a folder of suggestions which the company has issued, in which are illustrated gifts to meet all purses. The company has also issued to each of its consumers its calendar for 1940. This is as attractive as ever, each monthly sheet bearing a colourful picture of a rural scene in the company's area of supply.

Northmet calendar

Church Lighting

We are pleased to hear from Holophane, Ltd., that the market for church lighting equipment, which has been apparently "dead" since the commencement of the war, is showing signs of reviving, and that the company is now again

receiving inquiries for installations. This class of work is a speciality of the company, which has just brought out a well-produced publication comprising 44 pages and intended to appeal to church authorities, architects and electrical contractors. Copiously illustrated, the book shows the practical application of Holophane lighting to widely different types of ecclesiastical architure and also demonstrates the relative merits of different systems of illumination, *e.g.*, pendant, concealed, built-in, &c.

Diaries

We have received from Iliffe & Sons, Ltd., the 1940 diaries of the *Amateur Photographer* (bound in red leather cloth), *Wireless World*, *Autocar* and *Motor Cycle* (bound in navy blue leather cloth). These contain a great deal of useful information on subjects in their respective spheres, and will once again prove useful works of reference in a handy size. They can be obtained from the company at Dorset House, Stamford Street, London, S.E.1, or from booksellers and stationers at 1s. 6d. net.

Industry and War Risks

A representative meeting of the F.B.I. Executive Committee, under the chairmanship of Lord Dudley Gordon, was held on November 8th, when a full review of the Federation's activities during the past month was presented. Reports were received on British export policy, the Control of Prices Bill, and War Risks Insurance. In reference to the last item the Committee urged that premiums already paid should cover the insured up to January 2nd. The premium originally fixed was 30s. per cent. for three months. The first month's premium having now been remitted, it can be taken that the premium of £1 per cent. was regarded on October 3rd as adequate cover for a period of two months. More than half this period has passed without claims, therefore the same premium should be sufficient for the seven weeks from now to January 2nd.

On the question of taxation policy, and particularly in relation to Excess Profits Tax, a special sub-committee has been appointed to consider the whole matter. Relevant information is being sought from affiliated trade associations, and the sub-committee's proposals will be brought before the Grand Council for consideration in January. The problem of exports was also considered, and it was decided to continue close contact with the Board of Trade, and to press the view that exports should be given equal precedence with the requirements of the Service Departments. Lord Dudley Gordon also reported that he had written to the Minister of Supply about the position of small firms in executing armament orders, and had received assurances that all real capacity would be utilised.

The Federation states that trade inquiries received by it from overseas during October are nearly 50 per cent. up on those received during September, and that applications from overseas agents anxious to do business for British firms have more than doubled.

Eastbourne Electricity A.R.P. Workers

All electricity undertakings have their own A.R.P. organisations and it is important that their efficiency should be maintained by periodical demonstrations. At Eastbourne the A.R.P. organisation of the Electricity Department has weekly exercises and recently a demonstration of its efficiency was given to members of the Electricity Committee. The exercises included all branches of A.R.P. activity which the Department might be called upon to undertake in the event of an air raid, and they were carried out under the direction of the controller, Mr. N. Boydell, chief electrical engineer and manager. The Department's organisation includes squads for fire-fighting and ambulance work, repair work, and decontamination. The personnel numbers nearly 100, all of who have volunteered their services.

Engineers Required for the R.A.O.C.

The War Office announces that mechanical, electrical and automobile engineers are urgently needed by the Royal Army Ordnance Corps. Emergency commissions in the rank of lieutenant will be granted to suitable applicants, who should be between the ages of 23 and 55. Candidates must have practical workshop experience and must possess an engineering degree of a British university, or have passed the graduateship examination for mechanical or electrical engineers, or have qualifications exempting them. They will be required to serve either at home or overseas. Application should be made in writing to the Under-Secretary of State for War (A.G.9), War Office, Hobart House, Grosvenor Place, London, S.W.1.

Rhodesian Copper for Britain

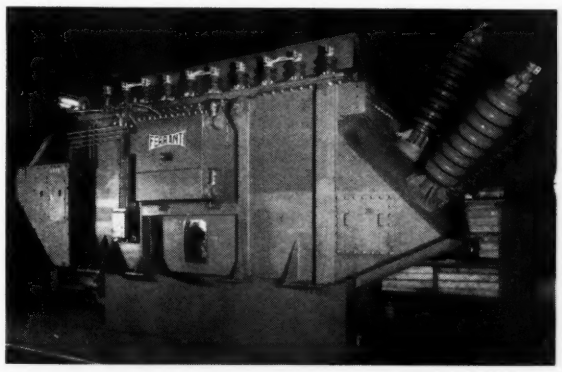
According to *The Times*, the Rhodesian copper producers have announced that they have entered into a contract with the Ministry of Supply under which they have sold a large proportion of their output for the duration of the war. The price to be paid is fixed and approximates to the level ruling immediately before the war.

Swedish Export Restrictions

Among the goods, export of which from Sweden is prohibited except under licence, are the following:—Accumulators and galvanic cells; electric lamps and lanterns and parts not specially mentioned in the tariff; carbon and metal filaments; carbon for electro-technical purposes (not specially mentioned); insulators of porcelain and other earthenware, white; articles, not specially mentioned in the tariff, of asbestos, mica and rubber of electro-technical purposes; insulated wire of base metals and electric cables, lines and cords; X-ray tubes and valves; electron tubes; X-ray apparatus and parts not specially mentioned in the tariff; and bakelite and other artificial resins intended to be pressed, capable of hardening or hardened, unworked.

A.R.P. Transformers

Several specially designed transformers (type "OFB") have been supplied by Ferranti, Ltd., to the Central Electricity Board for A.R.P. purposes. These transformers, which are rated at 20,000 kVA and have a ratio of 132/22-11 kV, are required for rapid installation under emergency conditions, and are specially designed to travel on existing standard railway and road trucks completely ready for service without further work on site. For transport easily detachable shields are provided round the porcelain bushings on both high- and low-voltage terminals to give protection against breakage. These shields can be removed on site in a few hours. The high-voltage terminals are brought out from one end of the transformer, while at the other end is the forced cooling gear consisting of air blast coolers with forced oil circulation. The pumps and coolers are operated from an auxiliary transformer mounted on the side of the main tank, the connections being permanently made. Terminals are also



Ferranti A.R.P. transformer ready for service

provided on this auxiliary transformer for supplying local lighting and services. A special feature of these transformers is the series/parallel connection for 22/11 kV on the low-voltage side. The necessary connections are all brought out to the terminals on the top of the tank so that the change from 11 kV to 22 kV can be carried out on site without disturbing the transformer. Other interesting features are the anti-fog type bushings on both high- low-voltage sides, the provision of a conservator, Buchholz relay and tapping switches for 15 per cent. voltage variation on the high-voltage side.

Proposed Australian Tariff Amendments

The *Board of Trade Journal* for November 9th contains details of a number of proposed amendments to the Australian customs tariff. The items affected include washing machines; hydro-extractors; rheostats, potentiometers, etc., for radio receivers; and cotton and paper covered copper wire.

Scottish Electricians' Conditions

Under an agreement arrived at between the E.C.A. of Scotland and the Scottish Council of the Electrical Trades Union journeymen and apprentices working 100 miles or more from their headquarters will be granted travelling facilities every three months. It was also agreed that sickness benefit should be paid to such men for a limited period.

Trade with India

In the course of his report for 1938-39 the Indian Trade Commissioner in London says that his department is being wrongly regarded as an expert organisation able to give advice on setting up industrial enterprises in India. In this connection inquiries have been received, *inter alia*, for information regarding the establishment of factories for the manufacture of dynamos and transformers. Other inquiries have related to the importation of British goods into India, a matter which is the concern of the Department of Overseas Trade. The Commissioner points out that his office is concerned with exports from India to the United Kingdom and Eire. In this connection it organises stands at exhibitions, provides information for firms engaged in the export of goods from India to this country, and participates in the work of commercial committees and international conferences.

The report states that India's exports of mica during 1938-39 fell to 161,844 cwt., valued at Rs. 1,14,11,540, as compared with 293,971 cwt. (Rs. 1,48,40,258) in 1937-38. The United Kingdom's share fell from 71,870 cwt. to 47,202 cwt. and that of the United States from 173,966 cwt. to 27,729 cwt. On the other hand, purchases by Germany and Japan

increased substantially. The United Kingdom took 5,829,542 lb. of rubber out of a total export of 17,218,212 lb. The exports of lac remained fairly steady at 642.254 cwt. and the United States and the British Empire were again the principal purchasers. The research work at the University of London was continued during the year.

During the year a Bombay firm asked for advice as to the possibility of exporting electro-medical apparatus to this country and was told that it would be costly and difficult to compete with established concerns here.

Paisley Electrical Engineers

The Paisley Association of Electrical Engineers has decided to suspend its proceedings indefinitely in consequence of the war.

Trade Announcements

Sunbeam Commercial Vehicles, Ltd., informs us that an arrangement has been made whereby Rootes, Ltd., will act as sole distributors in the London and surrounding area for the sale of Sunbeam battery vehicles.

MacGregor and McCallum, Ltd., whose temporary address is 20, Hillside, Banstead, Surrey, are not now in association with the Ace Electric Co., of Huddersfield, and therefore all orders and inquiries for "Vogue," "Mayfair" and "Magic" washing machines, from the North of England territory formerly handled by the Ace Electric Co., should be addressed to MacGregor and McCallum, Ltd.

Vitreous Enamellers

Meetings of the various sections of the Institute of Vitreous Enamellers are to be held at which recommendations will be made regarding the activities of the Institute in wartime and the Joint Technical Committee's publication on "Recommended method of testing acid-resistance enamels" will be discussed. The Southern Section will hold its meeting on November 22nd (7 p.m.) at the Charing Cross Hotel, Strand, W.C.2, and in addition to the above subjects Dr. B. Deutsch will give a paper on "Effect of Climatic Conditions on Vitreous Enamel." The meeting of the Midland Section will be held at the Chamber of Commerce, New Street, Birmingham, on November 23rd (7 p.m.), when the proceedings will also include a paper by Mr. R. L. Evans on "Recent Developments in De-enamelling." The Scottish Section is holding its meeting at the Royal Technical College, Glasgow, on November 20th (6.30 p.m.).

The annual meeting of the Institute will be held at the Midland Hotel, Birmingham, on November 30th (2 p.m.), and the business will include a discussion of the recommendations of the Sections relating to the Institute's future activities during wartime, and a review of the Joint Technical Committee's publication. A Special Sub-Committee has been appointed to investigate the continuance of the research work, and a report will be prepared and presented at the annual meeting for discussion. The meeting will be preceded by an informal luncheon at the Midland Hotel at 12.45 p.m.

Preserving Sandbags

The Ministry of Home Security has issued a memorandum on treatment for rot-proofing sandbag revetments in which it is stated that creosote or tar distillate, used as a water emulsion, or a solution of an organic copper salt in creosote made up into an emulsion, are suitable. The memorandum gives a specification to which the application of the preservatives should conform.

Belling Fires

Belling & Co. have issued a wall sheet illustrating their range of electric fires and heaters, and giving list prices. On the back of the sheet are illustrations and prices of spare parts for Belling electric fires. Reference to the various models is facilitated by indexes at the bottom of the sheet.

Indian Export Prohibitions

A recent "notification" by the Government of British India prohibits the export of the following goods from India except under licences issued by the Central Government in the Department of Supply:—Electric wires and cables; electrical insulating material; radio transmitting and receiving sets; drawn copper wire; and a number of metallic ores and metals including tungsten (wolfram).

Payment of A.R.P. Personnel

Under Home Office Circular No. 234/1939 there is a proviso that A.R.P. volunteers (all members of A.R.P. services are considered as volunteers, whether part-time or paid whole-time) who are already in the service of a local authority can retain their existing rates of pay. At St. Pancras arrangements have been made accordingly to transfer employees of the Electricity Department no longer required to the A.R.P. report and control centres at their existing basic rates of weekly wages without any payment for overtime. In so far as these rates exceed the £3 per week for civil defence services the amount will be defrayed by the Council, and the superannuation rights of the employees will be preserved.

A.R.P. Catering

Since the beginning of the war arrangements have been made at St. Pancras for food to be supplied to A.R.P. workers at the depôts and control centres. A manager was recently appointed and has suggested various improvements, including the purchase of electrical apparatus. A scheme has also been prepared for the adaptation of certain depôt buildings for canteen arrangements at a cost of £500, together with the provision of electrical kitchen equipment at a cost of £2,400 and furniture costing £200. On being approached for a grant, however, the Home Office commented on the cost of the proposals, which was considered excessive. The borough treasurer has replied strongly supporting the need for the scheme.

Unit Construction A.R.P. Shelters

Federated Sales, Ltd., 80, Grosvenor Street, London, W.1, are marketing the F.S.50 air-raid shelter, a feature of which is the adoption of the unit construction principle. The F.S.50 is constructed of cast-iron units bolted together to make a complete shelter, approximately 42 ft. 6 in. long by 5 ft. wide with a head room of 6 ft. 6 in. Erection is speedy and can be carried out by unskilled labour. The shelter complies with Home Office regulations.

Supervising Electrical Engineers

The lecture on "The Eleventh Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings" to be given by Mr. E. A. Reynolds will be presented at the meeting of the Association of Supervising Electrical Engineers on November 21st at the Lighting Service Bureau, London, at 6.30 p.m., when Mr. J. R. Beard, M.Sc., M.I.E.E., immediate past-president of the Association, will preside.

Prices of Materials

No change in the prices of materials was reported on November 15th by Henry Gardner & Co., Ltd. (copper bars, best selected, sheet and rod, English pig lead and English block tin), Edward Till & Co. (india-rubber, Para fine), and F. Smith & Co. (electrolytic copper bars, wire rods and h.c. wire).

New Catalogues and Lists

Benjamin Electric, Ltd., Brantwood Works, Tottenham, London, N.17.—In the company's new general lighting equipment catalogue (No. 1600) special care has been taken to avoid overcrowding the pages. Thus each item is given ample space and the specification details are clearly set out. A subject index is arranged alphabetically and among the many interesting products covered are the "Saaflux" system, "Glassteel" diffusers, visors, a new rectangular hoarding, a new stock bin unit, heavy-duty vapour-proof fittings, daylight inspection units, adjustable workshop brackets now available in locking types, luminescent signs for black-out use, A.R.P. adaptors, new wire guards, new electric-discharge porcelain well-glass fittings, electric-discharge combination diffusers, and "Bencolites" with utility chains.

J. G. Smithson & Co., Ltd., Melchett Road, Kings Norton, Birmingham.—A leaflet relating to a new cam-operated contactor controller.

British Insulated Cables, Ltd., Prescot, Lancs.—Lists P.F. 348-350 dealing with terminal boxes of the indoor, right-angle, horizontal entry type (for up to 11 kV) and the medium-voltage tier type.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2.—An illustrated catalogue of "Ediswan" traction batteries for electric vehicles, trucks and locomotives.

Revo Electric Co., Ltd., Tipton, Staffs.—A folder illustrating and describing A.R.P. lighting equipment for air-raid shelters and for general low-intensity illumination.

Gent & Co., Ltd., Faraday Works, Leicester.—Catalogue Book 5, Section 7d, dealing with synchronous electric clocks of the domestic, industrial and turret types.

Newman Industries, Ltd., Yate, Bristol.—A folder and a leaflet relating to Newman totally enclosed, fan-cooled motors.

Belling & Co., Ltd., Bridge Works, Southbury Road, Enfield, Middlesex.—A folder giving details of electric heating and small cooking apparatus for A.R.P. and emergency purposes.

Wm. Sanders & Co. (Wednesbury), Ltd., Falcon Electrical Works, Wednesbury, Staffs.—An emergency war list of the company's ironclad switch and fuse gear, safety sockets, switch sockets and plugs for domestic and industrial purposes.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

A.B.C. washing machine (agent).
HARVEST pump.
DOUBLE TOP dartboard lamp.
NONOX torch (agent).
GREY DAWN mercury vapour lamp.
TALMETO and OSYL metal packing.
M.M. & S. malleable iron adaptors for flexible conduit.

ELECTRICITY SUPPLY

Chester Corporation Test Commissioners' Decision. Classification of St. Pancras Undertaking. More Lighting Experiments. Encouraging Statement at Great Yarmouth

Billingham-on-Tees.—SCHEMES POSTPONED.—The North-Eastern Electric Supply Co., Ltd., has deferred plans for supplying electricity to the Sweethills area. Similarly, the Urban District Council has decided to postpone consideration of tenders for electrical installations in houses in Belasis Lane.

Birmingham.—NO TARIFF INCREASE CONTEMPLATED.—The *Birmingham Post* reports that no immediate tariff increase is contemplated by the Electric Supply Department. Mr. F. Forrest, the chief engineer and manager, has stated that it is hoped to continue for some time on the present scale; if there is an increase it will be small. A rise in the price of gas, however, is regarded as inevitable.

Blackburn.—LIGHTING DEMONSTRATION.—A new system of public lighting to cope with the black-out was demonstrated by the Electricity Department on November 10th. The equipment is designed to provide a modified form of street lighting to aid pedestrians, with a restricted illumination of road direction signs for the benefit of motorists. Mr. R. H. Harral, electrical engineer, and his staff carried out the demonstration to show that the department is prepared to alleviate black-out dangers. Use of the system is subject to Ministry approval, however. Among those present were the Mayor (Councillor E. Porter), Alderman C. A. Critchley (chairman of the Electricity Committee), the town clerk, borough engineer, and the deputy chief constable.

Bolton.—"BEACON" ROAD LIGHTING.—The Emergency Committee was favourably impressed by a demonstration on November 8th of a system of controlled street "beacon lighting" installed by the lighting superintendent, Mr. H. Hamer. The object is to pick out the roadway limits so that traffic may avoid mounting footpaths and pedestrians avoid colliding with lamp-posts.

Brighton.—INCREASED CHARGES.—Revised electricity charges which come into force from the December meter readings are some 12½ per cent. higher than existing rates. In a report on the position, the borough electrical engineer (Mr. W. N. C. Clinch) states that the undertaking is faced with a decrease in sales approaching 25 per cent. instead of an increase of 10 per cent., besides which the higher cost of coal has to be met.

Cardiff.—PENARTH SCHEME TO BE REVIVED.—At the outbreak of war the City Council postponed its application for a Special Order extending the electricity supply area to include the urban district of Penarth. The Electricity Commissioners have informed the Electricity Committee, however, that the matter is not one which should be deferred on account of the international situation, and that they are prepared to entertain such an application. The Committee has therefore decided to apply for the Order.

LOANS.—The Electricity Committee is seeking sanction to borrow £2,000 for sub-stations, £8,000 for meters, and £22,000 for domestic appliances.

Chester.—CORPORATION AND THE COMMISSIONERS.—Last week, sitting as a Divisional Court of the King's Bench, Lord Hewart and Justices Charles and Humphreys heard an ex parte application made on behalf of the Chester City Corporation for an order directed to the Electricity Commissioners with a view to quashing a decision recently made by them. It was explained that the Commissioners had refused consent to the extension of the electricity generating station of the Corporation at Queensferry, and that the decision of the Commissioners had been given in a form purposely to raise for argument certain points of law under the Electricity Acts that it was desired should be discussed and settled. The Court granted the application of the Corporation, and the matters in issue will be discussed by the Divisional Court at a later date.

Easington.—PROPOSED SUB-STATION.—The North-Eastern Electric Supply Co., Ltd., proposes to erect a sub-station at the Moorfield Stadium.

Great Yarmouth.—BETTER THAN ANTICIPATED.—Announcing at a recent meeting of the Town Council that the electricity charges during the present quarter would not be increased Alderman W. G. Knights said that since the beginning of the "black-out" the undertaking had done much better than was anticipated.

Hull.—HOSPITAL SUPPLY.—The medical officer of health reported to the Health Committee recently that the extra strain placed on the power plant at the Institution, due to the "black-out," was proving too much for its capacity. The master had suggested that the Electricity Department's mains should be extended to the Institution so that a supply could be taken when required. This would involve an immediate expenditure of probably £300, plus the cost of the electricity consumed, and might involve the Committee in the expense of re-wiring the installation, which had been previously estimated to cost £3,000. The city architect was requested to report on the matter.

Inverness.—TARIFF REDUCTIONS DEFERRED.—By a recent decision of the Town Council lower electricity charges were to come into force this month, but the Council last week agreed, on the advice of the electrical engineer (Mr. G. C. MacLean), that the proposal should remain in abeyance for the time being owing to the changed circumstances.

Kettering.—MODIFIED STREET LIGHTING INVESTIGATION.—The Town Council is to investigate the possibility of adopting some modified form of street lighting in view of the number of accidents that have occurred in the black-out. The matter has recently been discussed by several neighbouring local authorities.

Leeds.—PROPOSED SUB-STATION.—The Finance Committee has authorised an expenditure of £71,000 for the construction and equipment of a sub-station at Beeston Royds.

Lincoln.—NO INCREASE IN CHARGES.—The City Council has decided not to make any increase in the price of electricity at the moment, in spite of the increase in the cost of coal.

London.—ST. PANCRAS.—A standby supply of electricity for emergency purposes being required by the L.M.S. Railway at two pumping stations, the Special Emergency (Finance and General) Committee has agreed to the terms being fixed at £2 per annum per kW installed, plus the standard rate for power (¾d. per kWh).

Representations have been made to the Electricity Commissioners regarding the desirability of proceeding with the laying of mains in Brecknock Road at an estimated cost of £2,142, approved by the Council last July, especially as the Council is already committed to the purchase of the cable, which awaits delivery instructions.

With regard to the building of the extension to the Pratt Street Electricity Offices of the Council, additional costs incurred beyond the control of the contractor are to be allowed as an extra to the schedule prices contained in the contract. The work is to be proceeded with as quickly as possible.

The Special Emergency (Finance and General Purposes) Committee reported that a scheme for the reclassification of the electricity undertaking, with a consequent revision of the salaries of the technical staff, had been received from the Electrical Power Engineers' Association. The claim was formally rejected by the Committee, which would enable the Association to present its claim for hearing and adjudication by the District Joint Board.

NEW PLANT AT WATERWORKS.—The Metropolitan Water Board is to replace boiler plant at the Battersea works by electric motors and a central heating system at a cost of £5,000; this is expected to result in a saving of £500 on the present annual working expenses of £1,557.

Middlesex.—LIGHTING AND HEATING WARDENS' POSTS.—A complaint that after the electrical wiring of wardens' posts had been authorised and the work put in hand the instructions had been countermanded was made by Councillor W. J. Grimshaw (Hornsey) at a recent meeting of the County Council. He said that on October 3rd they had been told that the best means of lighting and heating wardens' posts was by electricity, and on October 13th this was reiterated, together with a statement that if they could get the work done at a cost of £8 per post, with 16s. 6d. for a heater, they could proceed with it. On October 18th they were told that an alternative method was being considered and on October 20th that lamps had been purchased in bulk which would serve both for heating and lighting. On this point Councillor Grimshaw commented that they had tried every possible kind of lamp and

Comfort in Air-Raid Shelters

THERE are many pleasanter places than an air-raid shelter on a cold, damp winter's day. At Hull, an opportunity to introduce an element of comfort into the shelter is offered by an enterprising scheme launched by Mr. D. Bellamy, general manager of the Electricity Department, who feels that even in these somewhat difficult times it is possible for an effort to be made to promote the use of electricity. In the *Hull Daily Mail* last week the Department took a half-page advertisement to draw attention to "The Warden" fire which the Department has specially introduced for shelters. Besides heating the shelter the fire has a trivet for a kettle "to ensure a welcome cup of tea" and also a warming rack for food. Complete with kettle it costs 14s. 6d. The advertisement also lists 39 local electrical contractors who can supply and install the fire. Arrangements have been made with the fuel overseers so that where any electric fire is installed in a shelter an allowance of 100 kWh per winter quarter and 50 kWh per summer quarter will automatically be granted.

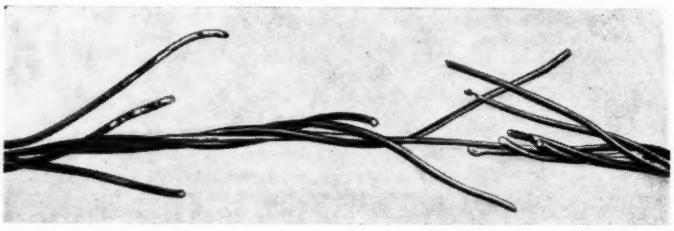
if somebody had bought lamps in bulk he was wasting his money; the wardens wanted light for their desks, not the floor. Since then they had been told that none of the electrical installations would be paid for, but subsequently that those which had been completed would be paid for, which still left 19 posts for which equipment had been bought. Sir Gilfrid Craig (chairman, Civil Defence Committee) replied that the Home Office had decided to adopt electric lighting and heating for wardens' posts, and the Committee accordingly gave instructions for the work to proceed. It appeared, however, that the Home Office circular only indicated policy. Later the Committee investigated the cost of heating and lighting by electricity and found that the cost of maintenance, with the heaters on continuously, would be "appalling." It therefore asked the Home Office about paraffin lamps. With these the cost would be very much less. Expenditure so far incurred by local authorities would be met.

Sheffield.—NEW SUB-STATION.—The Electricity Committee has arranged for the Works Department to erect a sub-station in Victoria Street at a cost of £4,000.

Sunderland.—HOSPITAL INSTALLATION.—The Town Council has agreed to proceed with the plan for alterations and additions to the electrical installation at the municipal hospital at a cost of £2,739.

Wolverhampton.—DAMAGED OVERHEAD LINE.—An unusual type of damage to an overhead line is illustrated in the accompanying photograph which we have received from Mr. T. A. G. Margary, borough electrical engineer and manager. The conductor consists of six strands of aluminium of 0.132 in. diameter laid about an inner steel core of the same diameter. The line is erected near a coppice on a large estate, and it is evident that the damage was caused by pellets fired from a sporting shot gun. It is presumed that a pheasant was sitting on the line at the time and the damage was thus the result of unsportsmanlike action.

Whitby.—SCHEME ABANDONED.—The Rural District Council has been informed that in the present circumstances the North-Eastern Electric Supply Co. has decided not to proceed with the scheme by which it was proposed to provide a supply to Goathland.



Overhead line damaged by shot-gun pellets

TRACTION

Cardiff.—PROVISIONAL ORDER FOR OPERATION OF TROLLEY-BUSES.—Application is being made to the Minister of Transport for a Provisional Order empowering the Corporation to use trolley-buses. The powers sought cover the existing 13 miles of double-track tramway route and extensions for a further 25 miles.

Rotherham.—NEW TROLLEY-BUS ROUTE.—Overhead equipment is being erected for a trolley-bus service to Templeborough.

Southern Railway.—IMPROVED TRAIN LIGHTING.—Last week the new white lighting approved by the Home Office and the Ministry of Transport was introduced on a number of steam and electric expresses, and it is hoped that all main-line stock will be similarly equipped by Christmas. The new lighting has to be adapted to the existing fittings, which are of many and varied types, but in general the system aims at giving, either by shoulder or ceiling lamps, a white light which will be supplemented by blue lights. During an air raid the white lights will be extinguished. It is necessary to darken with special paint the edges of every compartment window, to provide and fit lamp shades which will prevent any appreciable amount of light falling on to platforms when doors are open and to fix master switches which have to be operated in the event of an air raid.

Switzerland.—BENEFIT OF ELECTRIFICATION.—It is estimated that 13.7 million fr. was saved by the use of electricity for traction on the Swiss State Railways last year, as compared with the hypothetical cost if the lines had not been electrified, states our Geneva Correspondent. Altogether 611.3 million kWh was consumed by the railways during the year.

United States.—TRANSPORT SURVEY.—According to a survey of American transport services in 1937, details of which have been published in *Mass Transportation*, the division of business among the three types of service was roughly 72 per cent. to the street railways, 2 per cent. to the trolley-coaches, and 23 per cent. to the buses. Of the net earnings the street railways obtained 77 per cent., the buses 19.7 per cent., and the trolley-coaches 3.3 per cent. Rapid transit lines are included with the street railways in these figures. There were 58,731 vehicles in street railway service, 1,655 trolley-coaches and 28,056 motor buses, making a total of 88,442 vehicles in transportation service. There were 45,095 miles of route operated by motor-buses as compared to 685 miles by trolley-coaches and 20,985 miles of route for street cars.

The proportion of trolley-coaches in use at the time of the survey was small, but many more have since been placed in service. It is pointed out that the present-day trolley-coach is not the cumbersome vehicle that was suggested a few years ago and failed at that time to meet the requirements of modern service. It is an entirely different vehicle and one that should be given serious consideration in every problem arising in city and suburban service.

Ships' Electrical Equipment

New Rules of Lloyd's Register

LLOYD'S Register of Shipping, in order to maintain uniformity, has held up the overhaul of its rules and has actively participated in the work of the I.E.E. Ship Electrical Equipment Committee. The latter has recently issued the third edition of its regulations and, coincident with this, Lloyd's revised rules for electrical equipment have been published. The Society now has fully qualified electrical engineer surveyors stationed at the principal building ports in the United Kingdom, and their influence and the steady improvement which is taking place in ships' electrical installations are very marked.

Practically every section of the rules has been re-written, and the new requirements prohibit some methods and materials which were possible within the letter of the old rules, but have proved inadequate and can now be replaced by superior materials now available.

Special mention needs to be made of Section 15, which deals with the extra requirements for tankers, for it has been expanded to deal more precisely with the type of fitting permissible in various parts of a tanker, and also covers power circuits more completely. Large equipments with sufficient generator capacity to supply a moderate sized town brought with them problems which the existing rules were inadequate to cover. The sections on distribution and switchgear have therefore been re-cast to meet modern requirements.

Cables, always an important and expensive item, particularly in a large passenger vessel, have received special consideration and it is important to note that several types are no longer permitted, such as tough rubber sheathing for permanent wiring, armouring without lead sheath, flat twin and three core lead sheathed cables and all rubber insulated cables having pure rubber next to the conductor.

In the generator section important changes in technical requirements have been incorporated, but it is worth noting, since the change-over will require very careful co-ordination, that in future the series winding is to be on the negative, as is inland practice, and not on the positive. As this also affects the switchgear in relation to the connection of ammeters, overload trips and reverse current trips, close co-operation will be necessary during the change-over period. Fluorescent tube lighting is now common in passenger vessels and although the Society issued tentative requirements some time ago they have now been incorporated in the rules.

The revised rules are published in the Society's Rules for Steel Ships, 1939-40, and an extract of the electrical rules will be available shortly. They come into force for all new construction for which plans are approved after October 13th, 1939.

Maximum Weight of Vehicles

THE Public Service Transport Association has made representations to the Minister of Transport asking that the present maximum laden weight of omnibuses and trolley vehicles should be waived. The use of aluminium is now restricted to war purposes and, consequently, it is necessary to use other materials instead of aluminium in the construction of these vehicles. The increase in unladen weight which such a course necessitates would mean that, to keep the vehicles within the present limits of permissible laden weights, the seating capacities would have to be reduced.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. *each*) *can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

1937

35379. "Arrangements for increasing the selectivity of electric amplifying apparatus." L. De Kramolin. December 22nd, 1936. (Cognate applications 35380/37, 35381/37, 35382, 3, 4, 5 and 6.) (513626.)

1938

1675. "Loudspeaking telephone circuit arrangements." Radio Gramophone Development Co., Ltd., and H. F. Duffel. January 18th, 1938. (513678.)

1805. "Electron-discharge devices for use in television or like systems." Baird Television, Ltd., and V. A. Jones. January 19th, 1938. (513628.)

3434. "Television receivers." Scophony, Ltd., and A. H. Rosenthal. February 3rd, 1938. (513776.)

4465. "Electric insulating materials, and electric cables manufactured therewith." W. T. Henley's Telegraph Works Co., Ltd., and H. A. Tunstall. February 12th, 1938. (513630.)

4536. "Electric furnaces for melting or fining glass." E. V. Borel and Soc. Anon. des Manufactures des Glaces et Produits Chimiques de Saint Gobain, Chauncy et Cirey. February 14th, 1938. (513581.)

5004. "Electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd., and J. F. Ramsay. February 17th, 1938. (513679.)

6594. "Electric motors." British Thomson-Houston Co., Ltd. March 2nd, 1937. (513632.)

6755. "Nickel plating." Parker-Wolverine Co. April 14th, 1937. (513634.)

6833. "Electric motors." British Thomson-Houston Co., Ltd., and A. H. Maggs. March 4th, 1938. (Addition to 451099.) (513635.)

6845. "Electric condensers." Standard Telephones and Cables, Ltd., W. Y. Gibson and W. R. Moscrip. March 4th, 1938. (513636.)

6892. "Radio and like receivers for continuous waves." Marconi's Wireless, Telegraph Co., Ltd., and E. E. Zepler. March 4th, 1938. (513637.)

7247. "Electric-discharge lamps comprising material adapted to be excited to luminescence by an electric discharge. General Electric Co., Ltd. (Patent Treuhand Ges. für Elektrische Glühlampen.) March 8th, 1938. (Cognate application 27654/38 (Addition to 480356.) (513583.)

7379. "Luminescent substances for electric-discharge vessels." Soc. Anon pour les Applications de l'Electricité et des Gaz Rares Etablissements Claude, Paz and Silva. February 3rd, 1938.) (513584.)

7648. "Electron-discharge devices, particularly cathode-ray tubes." Standard Telephones and Cables, Ltd., F. D. Goodchild, D. H. Black and C. H. Foulkes. March 11th, 1938. (513640.)

7744. "Liquid-blast electric circuit-breakers." British Thomson-Houston Co., Ltd. March 12th, 1937. (513780.)

7855. "Manufacture of calcium carbide in electric furnaces." Akt. Ges. für Stickstoff-Dunger. March 27th, 1937. (513642.)

8073. "Electrically heated domestic cooking-stoves or ovens." Falk, Stadelmann and Co., Ltd., and W. H. Richardson. March 16th, 1938. (513684.)

8154. "Automatic voltage control in electric supply circuits." British Thomson-Houston Co., Ltd. March 16th, 1937. (513685.)

8216. "Control systems for electric motors." R. Bosch Ges. March 17th, 1937. (513645.)

8381. "Electro-therapeutic apparatus." Thermoray, Ltd., G. Jenkins and P. Adorjan. March 18th, 1938. (513781.)

8513. "Electric limit switch." D. Brown and Sons (Huddersfield), Ltd., and F. Lancaster. March 19th, 1938. (513646.)

8675. "Radio receivers and the like for operating alarm call and like devices." Marconi's Wireless Telegraph Co., Ltd., R. B. Armstrong, and E. E. Zepler. March 21st, 1938. (513647.)

9437. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. March 27th, 1937. (513652.)

9594. "Thermionic valves." Standard Telephones and Cables, Ltd., W. T. Gibson. March 29th, 1938. (513655.)

9778. "Electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd. March 30th, 1937. (513656.)

10046. "Electrical insulating material." British Thomson-Houston Co., Ltd., R. I. Martin and B. R. Tuppen. April 1st, 1938. (513687.)

10181. "Electrical wave filters." Marconi's Wireless Telegraph Co., Ltd. (Radio Corporation of America.) April 4th, 1938. (513660.)

10258. "Frequency translating circuits, particularly telegraph modulators." Standard Telephones and Cables, Ltd., and V. J. Terry. April 4th, 1938. (513661.)

10541. "High-tension cathode-ray tube apparatus." Telefunken Ges. für Drahtlose Telegraphie. April 6th, 1937. (513665.)

10598. "Electrical control apparatus responsive to variations in voltage." Aron Electricity Meter, Ltd., and E. J. Riordan. April 6th, 1938. (513592.)

10856. "Magneto generators." Associated Electric Laboratories, Inc. April 16th, 1937. (513669.)

10863. "Electro-deposition of metals." E. I. Du Pont de Nemours and Co. June 11th, 1937. (513670.)

11200. "Television receivers." Scophony, Ltd., and A. H. Rosenthal. April 12th, 1938. (513693.)

11427. "Arrangements for transmission and reception of sound waves." Electroacoustic Ges. April 22nd, 1937. (Cognate application 11428/38.) (513701.)

11437. "Magnetic sound recording and reproducing apparatus, and steel-tape record carriers therefor." P. V. E. Lindsay and W. W. Whiffin. April 13th, 1938. (513729.)

11485. "Means for closing electric circuit-breakers." G. Ellison, Ltd., and J. Anderson. April 14th, 1938. (513704.)

11492. "Alternating-current standard resistances." H. W. Sullivan, Ltd., and W. H. F. Griffiths. April 14th. 1938. (513597.)

11522. "Spark-gap device for internal-combustion engine ignition systems." R. J. McCarty. April 14th, 1938. (513599.)

11552. "Electrical impulse-sending devices." Standard Telephones and Cables, Ltd., and N. H. Martin. April 14th, 1938. (513600.)

11553. "Multi-position electric switches." Standard Telephones and Cables, Ltd., and B. B. Grace. April 14th, 1938. (513601.)

11573. "Thermionic valve amplifiers." Marconi's Wireless Telegraph Co., Ltd., and K. R. Sturley. April 14th, 1938. (513605.)

11574. "Apparatus for reproducing sound from sound-film." British Ozaphane, Ltd., and A. J. Field. April 14th, 1938. (513788.)

11583. "Counting apparatus for counting a number of electrical impulses." British Tabulating Machine Co., Ltd. April 15th, 1937. (513606.)

11590. "Electric control systems for synchronous dynamo-electric machines." British Thomson-Houston Co., Ltd. April 17th, 1937. (513607.)

11591. "Machine for basing electric incandescent lamps or similar devices." British Thomson-Houston Co., Ltd. April 17th, 1937. (513608.)

11683. "Prepayment mechanism for meters." English Electric Co., Ltd., G. Tilstone and J. F. Donelly. April 19th, 1938 (Cognate application 30026/38.) (513736.)

11716. "Cathode ray tubes." Fernseh Akt.-Ges. April 15th, 1937. (513739.)

11717. "Cathode ray tubes for use in television and like systems." Fernseh Akt.-Ges. April 16th, 1937. (513740.)

11759. "Dielectric properties of insulating material, particularly for electric condensers." Siemens and Halske Akt.-Ges. April 19th, 1937. (513746.)

11787. "Apparatus for the measurement of electric reactance." H. Waymouth, and Waymouth Gauges and Instruments, Ltd. April 19th, 1938. (513754.)

11813. "Incandescent electric lamps for motor vehicle headlights." J. F. Hulme. April 20th, 1938. (513790.)

11857. "Apparatus for measuring light." British Thomson-Houston Co., Ltd., and R. Maxted. April 20th, 1938. (513797.)

12168. "Liquid-break electrical switches or circuit-breakers." D. R. Davies and Metropolitan-Vickers Electrical Co., Ltd. April 22nd, 1938. (513803.)

14190. "Electric - discharge lamps. General Electric Co., Ltd. (Patent-Treuhand Ges für Elektrische Glühlampen.) May 12th, 1938. (513715.)

21262. "Television receivers." General Electric Co., Ltd., and D. C. Espley. July 18th, 1938. (513810.)

21485. "Impulse-registering devices of the type used in telephone systems." General Electric Co., Ltd., C. C. Puckette and G. Dewar. July 20th, 1938. (513811.)

22003. "Automatically re - closing switching arrangements." Akt. Ges. Brown, Boveri & Cie. July 31st, 1937. (513812.)

22182. "Controllers for electric motors." Igranic Electric Co., Ltd. July 30th, 1937. (513814.)

29312. "Apparatus for indicating tension or load on cables." H. A. Raphael. October 13th, 1937. (513770.)

29359. "Electric hand-lanterns." J. T. Helling. October 10th, 1938. (513672.)

30521. "Electrical liquid-volume indicators." H. Waymouth & Waymouth Gauges & Instruments, Ltd. April 19th, 1938. (Divided out of 513754.) (513771.)

32429. "Electrical frequency reducers." Soc. Anon. S.I.M.B.U. November 8th, 1937. (513673.)

1939

1066. "Electric water-heaters." J. H. Ewart. January 12th, 1939. (513820.)

7080. "Liquid-blast electric circuit-breakers." British Thomson-Houston Co., Ltd. March 3rd, 1938. (513619.)

9507. "Photo-flash lamps." British Thomson-Houston Co., Ltd. March 26th, 1938. (513822.)

TRADE MARK APPLICATIONS

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 8th:

Letter "C" with two connected Plus Signs (lettering and design). No. 605945. Class 7 (IV). Carbon and composition brushes for electrical machines, self-lubricating members forming parts of machinery, joints and journals, electric welding machines and parts of machinery made from carbon or carbon composition.—La Société Le Carbone-Lorraine, Gennevilliers, Seine, France. (British representatives: D. Young & Co., 11-12, Southampton Buildings, W.C.2.)

Sumo. No. 609267. Class 7 (IV). Electric pumps.—Sumo Pumps, Ltd., Glass Works, West Smethwick, Staffs.

Hytron (lettering and design). No. 603177. Class 9 (IV). Thermionic valves for use with radio transmitting and receiving apparatus.—International Majestic Radio Corporation, Ltd., 173-175, Farringdon Road, E.C.1.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

John W. F. Warren & Co., Ltd.—Private company. Registered November 4th. Capital, £500. Objects: To carry on the business of electricians, engineers, and in particular manufacturers of and dealers in steam apparatus, manufacturers and workers of and dealers in electricity, wireless, motive power and light, &c. Directors: J. W. F. Warren, 32, Beech Grove, Linthorpe, Middlesbrough, E. I. Lawrence, 34, Beech Grove, Linthorpe, Middlesbrough, and N. Dunn, 91, Green Lane, Linthorpe, Middlesbrough.

Silva Stream Radio Manufacturing Co., Ltd.—Private company. Registered October 30th. Capital, £100. Objects: To carry on the business of manufacturers of electrical fittings, batteries, lamps, cables and other electrical accessories, merchants and dealers in radio and television apparatus, &c. The directors are: Mrs. R. C. Shipper, 5, Oakland Drive, Prestwich, Manchester, M. Bookbinder, 26, Huxley Avenue, Manchester, 8, and J. Casey, 14, Weybourne Avenue, White Moss, Blackley, Manchester. Registered office: 18, Corporation Street, Manchester, 4.

Arcolectric (Twickenham), Ltd.—Private company. Registered October 30th. Capital, £100. Objects: To carry on the business of plastic moulders, electrical and mechanical engineers and contractors, manufacturers of and dealers in radio components, apparatus, &c. The directors are: Richard Collier, The Crows Nest, River Bank, West Molesey, Surrey, and Ronald Collier, Upton, Manor Close, Ruislip, Middlesex.

S. May (Leicester), Ltd.—Private company. Registered October 24th. Capital, £500. Objects: To acquire the business of a radio and electrical engineer, carried on by Samuel May. The directors are: S. May and Mrs. R. May, both of 36, Highway Road, Leicester. Registered office: 18, Church Gate, Leicester.

D. H. Gittins, Ltd.—Private company. Registered October 31st. Capital, £5,000. Objects: To acquire the business of an electrical engineer carried on by D. H. Gittins at 39 and 40, Broad Street, Birmingham, as "D. H. Gittins & Co." The directors are: D. H. Gittins (permanent governing director) and Mrs. M. C. Gittins, both of Manor House, West Hagley, Worcs. Solicitors: Wragge & Co., Birmingham.

Chiswick Engineering, Ltd.—Private company. Registered November 1st. Capital, £400. Objects: To carry on the business of electrical, mechanical and general engineers, electricians, motor makers, cabinet makers, manufacturers of and dealers in radio apparatus, &c. The directors are: A. Sacks, 18, Heathcroft, Ealing, W.5, and three others. Registered office: 7, High Road, Youngs Corner, Chiswick, W.4.

Penetray Lighting Units, Ltd.—Private company Registered November 6th. Capital, £100. Objects: To carry on the business of electrical engineers and general electrical installation contractors, manufacturers of and dealers in electrical and artificial lighting apparatus, lamps, fittings and accessories, &c. The first directors are C. Paerse and M. Mellor and one other to be appointed by them. Registered office: Office No. 12, 3, York Street, Manchester.

H. H. Linton & Company, Ltd.—Private company. Registered November 9th. Capital, £100. Objects: To carry on the business of importers, exporters and manufacturers of wireless sets and electrical goods, &c. Directors: H. H. Linton, 19, Ossulton Way, Hampstead, N.2; and B. W. Brown, Windyridge, Harkham, Pevensey, Sussex.

Herberts (North Wales), Ltd.—Private company. Registered November 8th. Capital, £1,000. Objects: To acquire the business of a radio and electrical goods dealer carried on by H. Hodkinson as "Herberts" at 12, Rhos Road, Rhos-on-Sea, N. Wales. The directors are: H. Hodkinson (permanent), Fairholm, Penrhyn Avenue, Rhos-on-Sea; and H. Bayley, "Sunnyside," Pine Grove, Rhos-on-Sea. Secretary: J. H. Hibbert. Registered office: 12, Rhos Road, Rhos-on-Sea, N. Wales.

Companies' Returns

Statements of Capital

Falconar, Cross & Co., Ltd.—Capital, £7,000 in 3,500 preference and 3,500 ordinary shares of £1. Return dated August 23rd. 3,300 preference and 2,002 ordinary shares taken up. £2 paid, £5,300 considered as paid. Mortgages and charges: £4,601.

Flinders (Wholesale), Ltd.—Capital, £7,250 in 3,000 non-cumulative preference and 4,000 "A" ordinary of £1 and 5,000 "B" ordinary shares of 1s. each. Return dated September 1st. 3,000 preference, 3,000 "A" ordinary and 3,025 "B" ordinary shares taken up. £6,151 5s. paid. Mortgages and charges: £21,295.

R. Darbyshire (Wholesale), Ltd.—Capital, £2,000 in £1 shares. Return dated September 2nd. 1,435 shares taken up. £1,435 paid. Mortgages and charges nil.

Lamp Caps, Ltd.—Capital, £50,000 in £1 shares. Return dated July 12th, 1939. All shares taken up. £50,000 paid. Mortgages and charges nil.

H. Church & Co. (Essex), Ltd.—Capital, £7,000 in £1 shares. Return dated August 18th, 1939. All shares taken up. £7,000 paid. Mortgages and charges: £3,000 debentures.

J. W. Gray & Son, Ltd.—Capital, £10,000 in 40,000 shares of 5s. Return dated June 28th, 1939. 36,000 shares taken up. £6,000 10s. paid on 24,002 shares, £2,999 10s. considered as paid on 11,998 shares. Mortgages and charges nil.

G. A. Darby & Sons, Ltd.—Capital, £1,000 in £1 shares. Return dated August 9th, 1939. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Buchanan & Curwen, Ltd.—Capital, £15,000 in 11,000 6 per cent. preference and 4,000 ordinary shares of £1. Return dated August 17th, 1939. 10,906 preference and 4,000 ordinary shares taken up. £2,300 paid. £12,606 considered as paid. Mortgages and charges, nil.

Valco Dry Battery Co., Ltd.—Capital, £8,000 in 1,500 preference and 6,500 ordinary shares of £1 each. Return dated August 18th. All shares taken up. £3,667 paid, £4,333 considered as paid. Mortgages and charges nil.

Mortgages and Charges

Matthews & Yates, Ltd.—First mortgage debenture, charged on the company's undertaking and property, present and future, including uncalled capital, and engines, boilers, machinery, &c., dated October 26th, 1939, to secure all moneys due or to become due from the company to Williams Deacon's Bank, Ltd.

Satisfaction to the extent of £21,500, on October 26th, 1939, (a) of debentures dated September 19th, 1905, and registered October 6th, 1905, securing £7,000; (b) of debentures dated March 13th, 1906, and registered April 2nd, 1906, securing £1,500; and (c) mortgage debenture dated September 20th, 1917, and registered October 9th, 1917, securing £13,000.

Maurice End, Ltd.—Debenture charged on the company's property, including uncalled capital, dated October 31st, 1939, to secure £1,257. Holder: M. End, 83, Bishops Road, Prestwich, Lancs.

F. Reid Ferens and Co., Ltd.—Satisfaction to the extent of £20,000 on October 12th, 1939, of debenture dated January 3rd, 1935, and registered January 14th, 1935. Particulars filed of debentures, not exceeding £20,000, authorised October 12th, 1939, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £20,000

Geo. W. Glascock & Co., Ltd.—Debenture charged on the company's property, present and future, including uncalled capital, dated October 26th, 1939, to secure £200. Holder: Frederick Lascoe, 187, Parsonage Lane, Enfield.

Receivers Released and Appointed

Electric & Radio Supplies, Ltd.—T. G. Cook, 6/8, Blagrave Street, Reading, ceased to act as receiver and manager on November 2nd, 1939.

Cheshire Cables, Ltd.—Wm. H. Arden, of 55, Brown Street, Manchester, ceased to act as receiver on November 4th, 1939.

Electric Movement and Engineering Co., Ltd.—R. C. Deith, of 8, Paternoster Row, E.C.4, was appointed receiver and manager on October 25th, 1939, under powers contained in debenture dated September 11th, 1939.

Company Liquidations

Wireless-Electric (Wholesale), Ltd., 23-4, North Street, Bristol.—The statutory meeting of the creditors was held on November 2nd at Bristol, when Mr. S. C. Coulson, one of the directors, occupied the chair. A statement of affairs was submitted showing ranking liabilities of £4,176. The net assets were £3,465, leaving a deficiency, as regarded the creditors, of £711. The issued capital of the company was £4,300, and so far as the contributories were concerned there was a deficiency of £5,011. A resolution was passed confirming the voluntary liquidation of the company with Mr. N. W. Osborne, of Rushton, Osborne & Co. 11/12, Finsbury Square, London, E.C., and Mr. A. Collins as joint liquidators. A committee of the principal creditors was also appointed.

Brentwood District Electric Installations, Ltd.—Meeting, December 14th, at 55, High Street, Crawley, Sussex, to receive an account of the winding up by the liquidator, Mr. J. N. Campbell.

Air Conditioning (G. W. Cross & Co.), Ltd.—Meeting, December 12th, at Pinners Hall, Austin Friars, London, E.C.2, to receive an account of the winding up by the liquidator, Mr. L. E. Fillmore.

Bankruptcy Proceedings

A. Rautanen, electrical, mechanical and wireless engineer, 17, Princess Street, Shrewsbury, and now 161, Leicester Street, Wolverhampton.—Discharge suspended for three months until January 16th, 1940.

J. J. Glover, electrical contractor, 24, Market Place, Reading.—Last day for receiving proofs for dividend, November 27th. Trustee, Mr. J. B. Simmons, 3, Forbury, Reading, Official Receiver.

S. G. Breed, radio dealer, 65, Stuart Street, Luton.—Receiving order made November 1st on debtor's own petition.

H. Atterby, electrical contractor, 11, Andrew Road, South Ferriby, Barton-on-Humber, lately residing and carrying on business at 1, Ash Tree Avenue, Great Grimsby.—Public examination December 7th at the Town Hall, Great Grimsby.

A. Burnham (Briardale Radio Services), electrical engineer, 121, Oak Lane, Bradford.—First and final dividend of 5s. 1d. in the £, payable at 71, Manningham Lane, Bradford.

J. Laycock (Laycock and Ridding), "Lockend," Elam Wood Road, Riddlesden, Keighley.—First and final dividend of 6¼d. in the £, payable at 71, Manningham Lane, Bradford.

Reports and Dividends

The Perak River Hydro-Electric Power Co., Ltd., held its annual meeting on November 3th when Mr. G. Balfour (chairman), who presided, said that the

(*Continued on page* 663)

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange markets are working under the impression that this present week is likely to see a more active development in war operations. Probably this feeling was fostered by the expectation that Germany would invade the Low Countries during the last week-end. As nothing definite transpired on the Dutch and Belgian frontiers, and as, from Holland, especially, the view came that peace negotiations are not finally closed, an improvement in values occurred. The general sentiment of the House grew firmer. There remains, nevertheless, the impression just mentioned that dramatic happenings may be near at hand.

It is noticed that Stock Exchange prices show a tendency to ease off or to advance, in strict accordance with what may be called the mood of the moment. The volume of business is more concerned at the present time with the number of small orders rather than with the carrying-out of the substantial dealings which resulted, last month, in so considerable a rise in the prices of gilt-edged stocks. This rise has had the effect of quickening an interest in the majority of industrial companies, amongst which those connected with the electrical industry are by no means overlooked. Even on those days when prices appear to be dull and the gilt-edged leaders are falling back, the would-be purchaser of first-rate industrial shares finds it as hard as ever to satisfy his requirements when he comes to put money into the shares of many front-rank industrial companies.

Electricity Supply

Circumstances may rob the Electricity Commissioners' annual figures of some of their immediate interest, but the 8.3 per cent. increase in electricity production to the year ended in March was received with satisfaction. More to the point was the rise of 14 per cent. in the October output of the Edmundsons' group of companies. In view of the hesitancy which appeared in many sections of the Stock Exchange the market in electricity supply shares can be considered to have done well this week in holding its ground. Advances, indeed, are shown by Lancashire Electrics, at 28s. 3d. and Bournemouth and Pooles, at 58s. 9d. South Londons, which have fallen from 23s. 9d. to 22s., are an exception. Preference and debenture stocks remain in short supply.

In the overseas group, the recent improvements in Tokyo "sixes" and Whitehall Investments preference have held good. Palestine Electric "A," now 25s., are 2s. 6d. better on the week. Atlas Electric ordinary have changed hands up to 1s. 9d.

This Week's Dividends

The Johnson & Phillips directors evidently incline towards a liberal view of the situation discussed above, for the interim dividend has been raised from 5 to 7½ per cent. Last year's total distribution was 12½ per cent. Pleasantly surprised, the market advanced the price of the shares from 36s. 3d. to 40s., ex dividend, the impression being that the company must be doing well and anxious for shareholders to have the immediate benefit. Maintenance of the interim dividends was sufficient to raise the price of Southern Areas from 17s. to 18s., and of Telephone Manufacturing from 7s. 6d. to 8s. xd. Ensign Lamps at 15s. xd., are lower, although the final dividend of 15 per cent. again brings the total for the year to 25 per cent. Electrical Switchgear Manufacturers have declared a dividend of 10 per cent. for the year against 16 per cent. last time. The price at 21s. xd. is down 2s. Ward & Goldstone have declared an interim dividend of 10 per cent., as against 5 per cent., the object being, however, to equalise the annual payment. No indication, says the official statement, as to the final dividend is implied. Madras Electric Supply has declared an interim dividend of 2 per cent. tax free, as against 2½ per cent. a year ago.

Diversities of Policy

There is evidence of a division of opinion among boards of directors as to the proper dividend policy in these times. Some are inclined to fall back on the defensive against contingencies, preferring to conserve resources at the expense of dividends. Others evidently believe a reasonably liberal distribution of the profits to be the right of shareholders, and the proper course from the point of view of the national welfare. Inevitably share prices are much influenced by the rate of dividends declared, irrespective of the profits shown to be actually available for distribution: although if a dividend decision manifestly leaves a company with a good proportion of undivided profits in hand, this will generally have its influence on the price of the shares concerned. In other words, the tendency is to pay more attention to dividends declared than to the earnings behind them. Directors continue to interpret their dividend duties in different ways, but a tendency is noticeable for the extreme caution of the first week or two of the war to be relaxed in favour of more generous payments.

Dividend Estimates

Although the next batch of dividend declarations from the Home electricity companies is not due to make its appearance until early next spring, discussion is already rife as to what course the companies may be expected to adopt in their dividend policy. As a whole, electricity supply companies are managed with a degree of what may be called ultra-caution. The directors are sometimes jestingly charged with being ready to make any excuse for keeping down distributions. This time, they will have such matters as restricted lighting, the black-out, evacuation and similar war measures with which to justify the reduction of dividend payments.

On the other hand, and as it has already been mentioned here, the majority of companies are now supplying power to factories, &c., on a much greater scale than usual. This applies particularly to the provincial companies, whose finances, by the way, are quite strong enough to warrant the previous distributions being maintained. The Edmundson Company published only last month increased profit figures, and announced a maintenance of the previously paid dividend. In the market it is considered, nevertheless, that there may be a reduction in some of the rates, and this seems to be already discounted by the fall which has taken place in the price of the shares, lowering the general rate of quotations to a basis on which the yield ranges from 5 per cent. to 6 per cent. on the money.

Wessex Electricity

Offered at 95¾ free of stamp to the buyer, a small line of Wessex Electricity 3¾ per cent. debenture stock is obtainable, at the moment, in the Stock Exchange market. The issue, £1,500,000 stock, was made earlier this year at 96¼ and the final call fell due a week ago. Interest is payable on the first of February and August, the first distribution being £1 6s. 8d. per cent. next February. All the ordinary share capital of the company is held by Edmundsons Electricity Corporation. The interest service is well protected on the company's annual earnings in the past three years. The stock is redeemable at 100 in August, 1959, the company reserving the right to repay it five years earlier. By comparison with various other industrial debentures it may be thought that this Wessex stock looks fairly well valued at 95¾, but in view of the difficulty that still persists in the way of acquiring sound debenture securities, the stock will probably be absorbed easily enough. At 96 the running yield is £3 18s. per cent. Assuming redemption at 100 in 1959 the return comes to £4 0s. 9d.

Stocks Below Par

The Government enjoy an earned reputation for enveloping with close reserve whatever intentions they may have for inviting subscriptions to any National Loan. That a new issue of a Defence Loan, colossal in extent, is on the point of being made, everyone knows, but the terms, and the date of the announcement are jealously-guarded secrets. The handsome recoveries that have taken place in British Government stocks over the past few weeks are, however, unmistakeable pointers to the certainty that the new loan, in its various shapes, will come out at a relatively high price. Therefore, with this assurance in mind, investment is still keen upon the purchase of any well-secured stock—particularly if a definite date of repayment is attached to it—that stands below its par price. It is no exaggeration to say that hardly any stock of such nature can be obtained except on the occasion of a deceased account coming into the market for realisation.

Flights of Fancy

The menace deemed to have been held over Holland and Belgium by German threats of invasion was said, in some quarters, to have exercised a depressing effect upon prices of American shares. This misconception was apparently founded on the theory that Dutch and Belgian holders of American securities would hasten to realise if their country were faced with immediate crisis. Actually, the reverse might be expected. Residents in Holland and Belgium who happen to have money in New York would certainly not try to get it home, even if they were able to do so. They would be eager for it to stay in a place of safety.

Speaking generally, movements of capital from one country to another are nowadays made so difficult by the restrictions imposed on account of war regulations, that the selling of stocks and shares in one country by nationals who reside in another is more likely to be a figment of imagination than a financial fact. The fall of £2 in Great Northern Telegraphs to 25½—practically the lowest of the year—is due, of course, to the international complications, the company being Danish, with its 8,400 miles of cables spread across Europe and Asia.

Miscellaneous Matters

A bargain has been marked in London Transport "C" stock at ½ above the fixed minimum price of 65, but the stock is still virtually unsaleable at that price. Since control of the Board's system has now passed to the Government, the plans of the stockholders' committee have been shelved. Previously, the committee had been considering steps in view of the failure of the "standard" 5½ per cent dividend to materialise. In the fixing of the Government compensation to railway stockholders, it is hoped that proper recognition will be given to the early success of the higher fares policy, which was bidding fair to restore the position of the Board. In the Home Railway market, the margin between current prices and the unofficial minima has widened so far as to cause the latter to be abolished. Prices have eased in the past few days, Southern preferred being 2 points lower at 57. South American issues have been restored further to favour by a growing recognition of possible wartime benefits to that Continent. Rio 5 per cent. bonds are 70, against 60 week ago and 55 a week earlier. Anglo-Argentine Tramways 4 per cent. stock, at 9¼, has added 1½ points to the previous advance of 2½ points. Mexican Light first bonds rose 4, to 27½.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price Nov. 14	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	57/–	15	15	58/9	+⅛	5 2 0
British Power and Light	30/9	21/–	7	7	25/–	—	5 12 0
City of London	33/9	23/6	7½	7½	24/–	—	6 5 0
Clyde Valley	37/9	27/6	8	8	33/3	—6d.	4 16 3
County of London	46/9	28/–	10½	10½	36/3	—	5 16 0
Edmundson's :							
7% Pref.	31/6	27/6	7	7	28/–	—	5 0 0
Ord.	27/9	18/6	9	6	23/6	—	5 2 2
Elec. Dis. Yorkshire	41/6	32/6	9	9	35/–	—	5 2 5
Elec. Fin. and Securities	47/9	40/–	12½	12½	40/–	—	6 5 0
Elec. Supply Corporation	51/9	41/–	12	12	41/3	—	5 16 0
Isle of Thanet	20/–	15/–	4	4	15/–	—	5 6 8
Lancs Light and Power	34/6	25/–	7½	7½	28/3	+9d.	5 6 1
Llanelly Elec.	22/6	17/6	5½	5½	18/–	—	6 2 3
Lond. Assoc. Electric	30/–	18/9	7	7	18/9	—	7 9 4
London Electric	34/3	22/6	7	7	25/–	—	5 12 0
London Power Deb. Red.	106½	98	5	5	103½	—	4 16 6
Metropolitan	51/–	35/–	12	12	37/–	—	6 9 9
Midland Counties	38/9	30/–	8	8	35/–	—	4 11 5
Mid. Elec. Power	41/9	35/–	8	9	36/3	—	4 19 4
Newcastle Elec.	28/9	26/–	7	7	26/3	—	5 6 8
North Eastern Electric :							
Ordinary	32/3	23/6	7	7	27/6	—	5 1 10
7% Pref.	32/6	27/6	7	7	29/6	—	4 16 7
Northampton	48/–	41/–	10	10	42/6	—	4 15 0
Notting Hill 6% Pref. (£10)	12½	11½	6	6	11½	—	5 4 4
Northmet Power :							
Ordinary	46/6	30/6	10	10	37/6	+6d.	5 6 8
6% Pref.	29/–	23/6	6	6	27/–	—	4 9 0
Richmond Elec.	29/–	21/6	7	7	23/9	—	5 18 0
Scottish Power	38/9	28/6	8	8	32/6	—	4 18 6
Southern Areas	22/9	17/–	5	5	18/–xd.	+⅛	5 11 1
South London	30/9	23/9	7	7	22/–	−1/9	6 7 3
West Devon	23/3	18/9	5	5	18/9	—	5 6 8
West Glos	21/3	16/3	2	2½	16/3	—	3 1 6
Yorkshire Elec.	38/6	28/9	8	8	33/9	—	4 14 10
Overseas Electricity Companies							
Atlas Elec.	4/3	1/6	Nil	Nil	1/9	+3d.	—
Calcutta Elec.	39/–	25/–	10*	10*	30/6	—	—
Cawnpore Elec.	34/6	28/3	10	10	27/6	—	—
East African Power	26/3	20/–	7	7	22/–	+1/–	6 17 4
Jerusalem Elec.	24/6	21/–	7	7	21/–	—	6 13 4
Kalgoorlie (10/–)	10/6	9/–	7½	7	10/–	—	7 0 0
Madras	31/–	21/3	8*	8*	21/3xd.	+3d.	—
Montreal Power	35½	30	1½	1½	32	—	—
Palestine Elec. "A"	29/6	20/–	7½*	5*	25/0	+⅛	4 0 6
Perak Hydro-electric	18/9	13/6	6	2½	18/3	—	2 14 9
Shawinigan Power	24	20	85cts.	83cts.	24½	—	—
Tokyo Elec. 6%	61	37	6	6	60½	—	9 18 4
Victoria Falls Power	73/9	60/–	12½	15	68/9	−⅛	4 7 3
Whitehall Investments Pref.	19/6	12/6	7½	7½	14/–	—	10 14 2
Public Boards							
Central Electricity :							
1950–70	112	103	5	5	105½	+1½	4 14 8
1955–75	115½	104½	5	5	105½	—	4 14 8
1951–73	106½	101	4	4½	104	+2	4 6 3
1963–93	95½	84	3½	3½	86	+1	4 1 4
London Elec. Trans. Gtd.	88½	83	2½	2½	87	—	2 17 6
London & Home Counties							
1955–75	107½	105	4½	4½	105½	—	4 5 6
Lond. Passenger Transport :							
A	114½	103	4½	4½	105	+1	4 5 9
B	117½	102	5	5	105	+1	4 15 3
C	83½	64½	4	1½	65	—	2 6 2
West Midland Joint Elec.,							
1948–68	112½	104½	5	5	104½	—	4 15 8
Telegraph and Telephone							
American Tel. & Tel.	206	159	9	9	205	—	4 7 8
Anglo-Am. Tel. :							
Pref.	101½	82	6	6	86½	+1	6 18 9
Def.	23⅜	18½	1½	1½	20	+1½	7 10 0
Anglo-Portuguese	24/–	17/6	8	8	18/9	+⅛	8 10 8
Cable & Wireless :							
5½% Pref.	95½	75	4½	5½	85½	—	6 8 8
Ord.	55	34	4	4	48½	—	8 5 0
Income	100	87½	—	—	89½	—	4 9 5
Canadian Marconi $1	6/–	3/9	—	Nil	5/6	—	—
Globe Tel. & Tel. :							
Ord.	31/3	23/6	7½*	7½*	26/3	—	6 0 0
Pref.	26/9	22/6	6	6	25/–	—	4 16 0
Great Northern Tel. (£10)	38	25	20	20	25½	−2	7 17 0
Inter. Tel. & Tel.	10½	5½	Nil	Nil	6½	—	—
Marconi-Marine	30/–	23/–	7½	10	26/3	+⅛	7 12 4
Oriental Telephone Ord.	2½	46/3	12*	12*	2 5/16	—	5 4 0
Radio Corpn.	8⅝	5⅜	8	6	7½	+½	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	7/–	10	10	8/–	—	6 5 0
Western Union	40½	19½	2⅜	—	35½	—	—
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	7/6	3/6	Nil	Nil	3/9	—	—
4% Inc.	16	5	Nil	Nil	9½	+1½	—
British Electric Traction :							
Def. Ord.	1025	515	5	5	700xd,	+11	—
Pref. Ord.	164	130	8	8	145xd.	+3	5 10 3
Bristol Trams	52/6	36/3	8	10	42/–	+⅛	4 15 5
Brazil Traction	13	7⅛	$1	50c.	9	—	—
Calcutta Trams	25/6	20/9	8	8	21/3	—	7 10 6
Cape Elec. Trams	18/–	16/9	5	5	17/–	—	7 1 2
Lancs Transport	37/9	27/6	10	10	30/–	—	6 13 4
Mexican Light :							
1st Bonds	25	20	5	5	27½	+4	—
Rio 5% Bonds	81	47	5	5	70	+10	7 2 10
Southern Rly. :							
5% Prefd.	75½	48	5	5	57	−2	8 15 6
5% Pref.	99½	79	5	5	84	—	5 6 3
T. Tilling	2½	32/6	10	10	38/3	+9d.	5 4 7
Tilling & B.A.	54/6	43/9	10	9*	45/–	—	4 2 3
West Riding	37/9	30/–	10	10	30/–	—	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	25/–	15	15	25/–	—	12 0 0
Assoc. Elec. :							
Ord.	45/3	31/3	10	10	40/–	—	5 0 0
Pref.	36/6	31/3	8	8	32/6	—	4 18 6
Automatic Telephone & El.	47/6	39/3	10	12½	40/–	—	5 17 8
Babcock & Wilcox	48/–	37/–	10	12½	42/6	+⅛	6 5 0
British Aluminium Ord.	58/9	48/9	12½	12½	52/–	−⅛	4 16 2
British Insulated Ord.	88/–	72/6	20	20	77/6	—	5 3 1
British Thermostat (5/–)	16/–	12/–	18½	18½	13/3	—	6 14 7
British Vacuum Cleaner (5/–)	22/6	12/6	40	40	12/6	—	—
Brush Ord.	5/9	4/–	Nil	Nil	3/9	—	—
Callender's	92/–	52/6	20	15	60/–	—	5 0 0
Chloride Elec. Storage	82/3	62/6	20	15	3½	—	4 12 4
Consolidated Signal	96/–	75/–	36½	36½	65/–	—	9 14 8
Crabtree (10/–)	25/6	17/6	17½	17½	21/3	—	8 4 9
Crompton Parkinson :							
Ord. (5/–)	21/–	12/6	12½	15	17/6	—	—
E. K. Cole (5/–)	9/–	3/–	10	Nil	4/6	—	—
Elec. & Musical Industries (10/–)	14/9	7/–	5	Nil	8/–	—	8 8 10
Electric Construction	38/6	25/–	12½	13½	32/–	—	7 4 5
Enfield Cable Ord.	58/6	42/6	25	16¼	45/–	—	7 8 5
Electrical Switchgear (10/–)	27/–	23/9	16	10	21/–xd.	−2/–	4 15 3
English Electric	36/6	25/–	10	10	31/3	−9d.	6 8 0
Ensign Lamps (5/–)	16/9	13/9	—	25	15/–xd.	−1/6	8 6 8
Ericsson Tel. (5/–)	43/–	35/–	25*	25*	35/–	—	3 11 5
Ever Ready (5/–)	25/–	18/–	35	30	24/6	—	6 2 5
Falk Stadelmann	27/–	17/6	10	6	17/6	—	6 17 2
Ferranti Pref.	25/6	22/–	7	7	22/–	—	6 7 3
G.E.C. :							
Pref.	31/9	26/3	6½	6½	27/6	—	4 14 6
Ord.	82/–	61/3	17½	20	75/–	—	5 4 4
Greenwood & Batley	27/6	22/6	7	15	22/6	—	13 6 8
Hall Telephone (10/–)	22/3	18/6	15	15	18/9	—	8 0 0
Henley's (5/–)	21/–	15/–	20	20	17/6	—	5 14 3
4½% Pref.	23/–	18/9	4½	4½	18/9	—	4 16 0
Hopkinsons	46/3	37/3	12½	15	37/6	—	8 0 0
India-Rubber Pref.	21/3	18/9	5½	5½	18/9	—	5 17 4
Intl. Combustion	120/–	97/–	32½	32½	5	—	6 10 0
J. Lucas	60/–	45/–	15	15	49/–	—	6 3 0
Johnson & Phillips	41/3	32/–	12½	12½	40/–xd.	+5/–	6 5 0
Lancashire Dynamo	72/–	55/–	25	25	2½	−5/–	10 0 0
Laurence Scott (5/–)	12/–	9/6	15	15	9/6	—	7 18 4
London Elec. Wire	31/6	28/6	12	7½	28/9	—	5 4 4
Mather & Platt	50/–	39/–	13½	13½	45/–	−⅛	6 0 0
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 0
Murex	85/9	63/9	20	20	75/–	−½	5 6 9
Pye Deferred (5/–)	13/9	7/6	25	25	7/6	—	16 13 4
Revo (10/–)	35/6	25/–	17½	17½	25/–	—	7 0 0
Reyrolle	61/–	52/6	12½	12½	53/9	—	4 13 0
Siemens Ord.	26/9	18/9	7½	7½	20/–	—	8 0 0
Strand Elec. (5/–)	5/6	2/6	10	4	2/6	—	6 3 1
S. Smith (1/–)	9/–	6/–	37½	50	6/3	—	8 0 0
Switchgear & Cowans (5/–)	15/–	10/–	20	20	11/3	—	8 18 0
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction	2½	32/6	10	10	32/6	—	6 3 1
Telephone Mfg. (5/–)	10/–	7/–	9	9	8/–xd.	+6d.	5 12 6
Tube Investments	91/–	72/6	23¾	23¾	83/9xd.	−⅛	5 14 0
Vactric (5/–)	4/3	2/3	10	4	2/6	—	8 0 0
Vickers (10/–)	24/6	14/6	10	10	17/3	−3d.	5 16 0
Ward & Goldstone (5/–)	22/6	19/6	20	20	19/9	—	5 1 3
Westinghouse Brake	54/9	36/–	17½	17½	2½	—	8 4 9
Walsall Conduits (4/–)	31/9	21/3	55	55	25/–	—	8 16 0
West, Allen (5/–)	7/6	5/9	7½	10	6/3	—	8 0 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.*1.

Australia.—December 6th. Victoria Railway Commissioners. Two 1,500-kVA and one 750-kVA transformers. (T. 28222/39.)*

Birmingham.—December 8th. Electric Supply Department. High-pressure steam pipework and associated valves and drain pipework for four new boilers and two new turbo-alternators at the Hams Hall "B" power station. (October 20th.)

Edinburgh.—November 20th. Electricity Department. One 15,000-kVA, 33/6.6-kV transformer with boosters, one 10,000-kVA, 33/6.6-kV transformer with boosters, and 33-kV, three-core cable and multi-core pilot cable. (November 3rd.)

November 21st. Scottish Special Housing Association, Ltd. Electrical work at four evacuation camps; N. J. Campbell, Secretary, 11, Drumsheugh Gardens.

Ipswich.—November 21st. Corporation. Steel-frame buildings for boiler and turbine house, and a 110-ton and other electric overhead travelling cranes at the new Cliff Quay power station. (October 6th.)

London.—BATTERSEA.—November 22nd. Electricity Department. Electric travelling jib-crane and hopper, weighing tower and rubber belt conveyor. (November 3rd.)

New Zealand.—WELLINGTON.—December 5th. Fifty 5-kVA transformers. (T. 27809/39.)*

February 13th. Three single-phase transformer units. (T. 28146/39.)* Two 2,250-kVA three-phase boosting transformers. (T. 28144/39.)*

February 20th. Seven single-phase transformer units. (T. 28148/39.)* Four single-phase transformer units. (T. 28147/39.)*

March 26th. Four single-phase transformer units. (T. 28143/39.)*

March 12th. 110-kV outdoor switchgear and steelwork. (T. 28145/39.)*

December 5th. 50-kV outdoor switchgear and steelwork for Hangatiki substation and 110-kV outdoor switchgear and steelwork for Ongarue sub-station (T. 27495/39.)* Four 10,000-kVA transformer units. (T. 27496/39.)*

December 13th. Switchboard cable. (T. 28213/39.)*

Northern Ireland. — MAGHERAFELT.—November 28th.—Installation of electric light and power wiring and fittings, Technical School extension, for Regional E.C.; R. T. M'Guckin, architect, Garden Street, Magherafelt.

Plymouth.—November 25th. Electricity Supply Department. Circulating water screen at the Prince Rock generating station. (November 10th.)

South Africa.—CAPE TOWN.—January 15th. Electricity Department. Booster pumps, complete with driving motors, &c., and piping, two sets of motor starting and control gear, two 3,300-V iron-clad switchboards, two 380/220-V iron-clad distribution boards and one overhead travelling crane. (T. 27966/39.)*

Wolverhampton.—November 28th. West Midlands Joint Electricity Authority. Two 2,000-kVA transformers. (November 3rd.)

Orders Placed

Carlisle. — Health Committee. Accepted. Radio equipment for city hospital (£88).—L. R. Booth & Co.

Ipswich.—Electricity Committee. Accepted. Electric van (£153).—Egertons, Ltd.

London.—FULHAM. — Electricity Committee. Accepted. Coal conveying plant (£12,741).—Naylor Bros. Revised quotation for gas washer plant (£179,854).—James Howden & Co.

ST. PANCRAS.—Borough Council. Accepted. Extension of contract with Chamberlain & Hookham, Ltd., for supply of electricity meters for twelve months at existing prices.

A.R.P. equipment and protective clothing for Electricity Department (£473).—Electrical Safeguards, Ltd. Lighting and heating wardens' posts (£148).—Thomas H. Smerdon, Ltd.

Northampton.—Watch Committee. Accepted. Electrical installation at new police premises (£3,246).—Grensells.

Sheffield.—Electricity Committee. Accepted. Automatic fire fighting equipment (£4,575).Pyrene Co.

Wilmslow.—Cheshire C.C. Accepted. Traffic signal alterations at Swan Street (£268).—Automatic Telephone & Electric Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Isolation block at City Hospital and staff home and radiology department at Woodend Hospital; city architect.

New premises in Wollowdale Place; Bon-Accord Tool Co., 34, St. Clair Street.

Abergavenny.—Market extension; borough surveyor.

Atherstone.—Twelve underground shelters; R.D.C. surveyor.

Barking.—Factory, Alfred's Way; A. F. Bulgin & Co., Abbey Road.

Financial Section (*concluded from page* 660)

Reports and Dividends—cont'd

accounts for the year under review showed a heavy decline in receipts and profits as compared with the previous year, but not greater than was expected in view of international disturbances. In the course of his remarks last year he had pointed out that the load on their generating plants had dropped during 1937-38 from 43,000 kW to 27,000 kW, and that in October, 1938, the load was only 20,000 kW. The opinion expressed that they were then on the low level of output and that, short of any world upheaval, they should see a better second half-year, was falsified by the events to which he had referred. They began the year 1937-38 with an 80 per cent. Malayan tin quota which held until the end of December; it then fell to 56 per cent. for the next three months, dropping in July, 1938, to a little over 33 per cent., on which low quota they started the past year. The load upon their plant fell from 20,000 kW in October, 1938, to 15,000 kW in July, 1939, and the kWh sold decreased from 214,000,000 in 1937-38 to only 94,000,000 kWh last year. They had not issued any of the capital authorised at the last annual meeting, and it was possible, if they continued to supply on something like their present demand, they would be able to liquidate their indebtedness without recourse to any substantial issue of capital.

The Sun Electrical Co., Ltd., reports a trading profit for the year to April 30th of £20,358, as compared with £25,583 in the preceding year, and a net profit of £14,905 (against £19,445). The ordinary dividend for the year is 2½ per cent. (against 5 per cent.), and after making various provisions, including £3,000 for tax reserve, a balance of £2,394 is carried forward (against £5,196 brought in).

British Industrial Plastics, Ltd., reports a trading profit for the year ended September 30th of £110,631, as compared with £97,565 in the preceding year, and a net profit of £22,404 (against £22,185). The ordinary dividend for the year is 8 per cent. (against 6 per cent.), and the balance carried forward is £3,917 (against £5,693 brought in).

Cape Electric Tramways, Ltd., reports a net profit for the year to June 30th of £30,423, as compared with £29,182 for 1937-38. The dividend for the year is maintained at 5 per cent. and £53,629 is carried forward (against £47,766 brought in).

The London Passenger Transport Board.—According to the *Financial Times*, at a meeting of the committee of holders of "C" stock on November 9th it was decided that as the Government is now in control of the Board's undertaking no useful action can be taken at present on the Board's failure to pay the statutory 5½ per cent. on the stock.

John I. Thornycroft & Co., Ltd., report a net profit of £179,171 for the year ended July 31st, as compared with £160,006 for the preceding year. Reserve receives £100,000 and £10,000 is placed to the benevolent fund. The ordinary dividend for the year is 10 per cent. (against 8 per cent.), and £53,877 is carried forward (against £45,456 brought in).

Johnson & Phillips, Ltd., have declared an interim dividend of 7½ per cent., less tax (against 5 per cent.).

Electrical Switchgear & Associated Manufacturers, Ltd., are paying a first and final dividend of 10 per cent. for the year to October 31st. In the previous year the final dividend was 10 per cent., making 16 per cent. for the year.

Radio Rentals, Ltd., announces that in view of dislocation caused through the removal of records from head office, it will not be possible to submit accounts for the year to August 31st until early in December. The final dividend on the ordinary shares will, it is anticipated, be paid shortly thereafter.

The Ebonite Container Co., Ltd., is maintaining its interim dividend at 3 per cent.

Ward & Goldstone, Ltd., are paying an interim dividend of 10 per cent. (against 5 per cent.). The increased dividend is made in order to equalise payments and no indication of the final dividend is implied.

The Associated Equipment Co., Ltd., has declared a final dividend on the ordinary stock of 1s. per £1 unit of stock, free of tax, making 1s. 6d. for the year to September 30th. The net profits for the year (subject to audit) are £179,500, as compared with £177,500 for 1937-38.

J. & F. Stone Lighting & Radio, Ltd., is paying no final dividend on the ordinary shares. An interim of 5 per cent. was paid. Last year the final dividend was 5 per cent., making 10 per cent. for the year.

The Southern Areas Electric Corporation, Ltd., is again paying an interim dividend of 2 per cent. on the ordinary shares.

The Telephone Manufacturing Co., Ltd., is maintaining its interim dividend at 2½ per cent.

Ensign Lamps, Ltd., has declared a final dividend of 15 per cent., making 25 per cent. for the year (unchanged).

The Madras Electric Supply Corporation, Ltd, is paying an interim dividend of 2 per cent. (against 2½ per cent.), tax free.

Beddington.—Extensions to factory; Precision Grinding, Ltd., Mill Green Road.

Billingham-on-Tees.—Houses and bungalows, Bede estate; C. H. Webster, builder, Bede Estate, Billingham.

Birmingham.—Decontamination station at Bordesley Green; H. J. Manzoni, city engineer, Council House, Birmingham, 1.

Extensions to premises for A. E. Godrich & Son, Wharf Street, Aston; W. Sapcote & Sons, contractors, 91, Camden Street.

Extensions to premises for J. Hudson & Co., Barr Street; W. & J. Webb, contractors, 257, Great King Street.

Factory, for Ether, Ltd., Tyburn Road; S. Smith & Co., Ltd., contractors, 205, Coronation Street.

Birtley (Co. DURHAM).—Club, for the Birtley British Legion; secretary.

Blackburn.—Extensions to Audley Hall Brickworks; Wood Bros.

Bolton.—Extensions to Lincoln Mills for R. Entwistle & Co., Washington Street; Bradshaw, Gass & Hope, architects, 19, Silverwell Street.

Bradford.—Completion of extensions to Technical College; borough surveyor.

Bromley.—Houses (38), Heath Rise and Hazlemere Way; W. L. Cook & Co., Ltd.

Cardiff.—Additions to premises, Dock Street, for W. & T. Avery, Ltd., 99, St. Mary Street.

Carmarthen.—Completion of work on County Buildings, for C.C.; P. Thomas, architect, Cardiff.

Cheshire.—Senior school, Heath Road, Runcorn, Cheshire Education Committee; county architect, Chester.

Chester-le-Street. — Houses, Camperdown Drive; T. Soulsby, builder, Pelton.

Cleckheaton.—Dairy and sterilising room, Moorhouse Farm, East Brierley; R. Mitchell.

Extensions to offices; Rustless Curtain Rod Co., Ltd., New Lane Mills.

Corby.—Central building, High Street; Kettering Industrial Co-operative Society, Ltd.

Coulsdon.—Dormitories, classrooms, &c., off Dean Lane, for U.D.C.; J. Leathart, architect, 39, Gordon Square, London, W.C.1.

Coventry.—Garage, Stoneleigh estate; city architect, Council House, Coventry.

Crawcrook (Co. DURHAM).—Extensions to United Services Club; W. Dixon and Son, architects, 1, Collingwood Street, Newcastle-on-Tyne.

Cromer.—Clinic and offices, Mill Road, for District Hospital; secretary.

Crook and Willington (Co. DURHAM).—Houses for the North-Eastern Housing Association, Northumberland Road, Newcastle-on-Tyne.

Darlington.—Report and decontamination centres (£6,000); E. Minors, borough surveyor.

Dudley.—Extensions to factory; Wilmott Trucks & Products, Ltd., Ivanhoe Street.

Dunston-on-Tyne.—Garage on the Team Valley Trading Estate, for St. Mary's Motors, Ltd.; Hadden & Hillman, Ltd., contractors, 127, New Bridge Street, Newcastle-on-Tyne.

Factory on Team Valley Estate, for the Danish Bacon Co.; J. R. Rutherford & Sons, contractors, Minories Joinery Works, Jesmond, Newcastle.

Durham.—Houses, Crossgate Moor Gardens; H. F. Mole, builder, Chester-le-Street.

Reconstruction of assize court for the C.C.; county surveyor, 20, Old Elvet, Durham.

Rebuilding Cassop Colliery Workmen's Victory Club; G. E. Matkin, architect, Barclays Chambers, Fawcett Street, Sunderland.

Easington.—Rebuilding stores at Murton for the Murton Co-operative Society.

Easthampstead.—Sub fire station, Crowthorne; R.D.C. surveyor.

Edinburgh.—Decontamination centre at Hospital, for Royal Edinburgh Hospital for Sick Children; medical superintendent.

Additions, alterations and two air-raid shelters at Astley Ainslie Institution, Grange Loan; superintendent.

Evesham.—Senior school; A. V. Rowe, architect.

Felling-on-Tyne. — Decontamination centre for the U.D.C. (£1,200); surveyor.

Gainford.—Additions to St. Peter's Schools; R. Burke, architect, Singleton House, Northumberland Road, Newcastle-on-Tyne.

Gargrave (YORKS).—Extensions to Airebank Mills, for Johnson & Johnson (Great Britain), Ltd.; Thomas Duckett & Son, contractors, Belmont Wharf, Skipton.

Gateshead-on-Tyne.—Block of offices at Davidson's Glassworks, The Teams, Gateshead; J. R. Rutherford & Sons, contractors, Minories Joinery Works, Jesmond, Newcastle.

Grangemouth.—A.R.P. cleansing station for Stirling and Clackmannan Joint A.R.P. authority; secretary.

Knutsford. — Senior boys school (£25,000); Church of England authorities.

Lancashire.—Alterations and additions at the Fulwood and Cadeley Council School, near Preston; S. Wilkinson, county architect, County Offices, Preston.

Leeds. — Buildings, Ellerby Lane; Maden & Ireland, Ltd.

Leyton.—Extensions to factory; Marco Conveyor Engineering Co., E.11.

Lichfield.—Hospital at Lysways, Longdon, for Mid. Staffs Hospital Board.

Liverpool.—Extensions to Hospital, for Board of Management of the Waterloo and District Hospital; E. B. Bailey, architect, 51, North John Street, Liverpool.

Llannon.—Extensions to Isolation Hospital; secretary.

London. — (LEWISHAM). — Additional depôt accommodation for A.R.P. services (£5,200); borough surveyor.

Lytham-St.-Annes. — Senior school; G. W. Lawson, borough surveyor, Town Hall.

Manchester.—Commercial garage, Joddrell Street and Austin Street; Burke & Churchill, architects, 15, Green Lane, Princess Street.

Mansfield. — Warehouse extension, Stockwell Gate; W. Pickard.

Melton Mowbray.—Alterations and extensions to 14, Nottingham Street, for Melton Mowbray Building Society; W. G. Herbert, contractor, King Street, Melton Mowbray.

Middle Herrington (Co. DURHAM).—Rebuilding Board Inn; Tadcaster Tower Brewery Co., Ltd.

Middlesbrough.—Air-raid shelter for the the Education Department; A. E. Hobbs, builder, Norton-on-Tees.

Morecambe.—Church, Torrisholme, for Rev. T. B. Reid.

Newcastle-on-Tyne. — Extensions to A.R.P. report centre, Jesmond Road, for the City Council (£3,000); city architect, 18, Cloth Market, Newcastle.

Houses in flats, Fenham Chase; Fenham Estates, Ltd., promoters, Newcastle-on-Tyne.

Newport (I.O.W).—Houses, Dodnor Lane; F. Cattell.

Northampton.—Houses, Carlyle Avenue; Chowns, Ltd.

Additions to leather factory, Burns Street; Rushton & Roe.

Works extensions; Harland Engineering Co., Ltd.

Norwich.—Completion of workshops, New Technical College; borough surveyor.

Peterborough.—Extensions to works; Peterborough Die-Casting Co., Princes Street.

Plymouth.—Alterations, Royal Exchange Inn, Lewdown, for Plymouth Breweries, Ltd.; C. W. Parkes Lees & Son, architects, Fowey, Cornwall.

Factory; L. Jeffrey & Son, Princess Street.

Houses, Efford Crescent; A. H. Haytor & Son.

Alterations and additions to premises, Chapel Street and Market Street; Union Savings Bank.

Alterations and additions, Marlborough Hotel, Marlborough Street, and Ocean Mail Hotel, Millbay Road; Plymouth Breweries, Ltd.

Alterations and additions, Cardiff Arms, Harwell Street; C. W. Blundell & Co.

Alterations and additions, Crown and Anchor, The Barbican; Starkey, Knight and Ford, Ltd.

Rowley Regis.—Factory, Powke Lane; Old Hill Co., Blackheath.

Runcorn.—Housing site, Ellis Lane, Frodsham; R.D.C. surveyor.

Rushden.—Additions to factory, Carnegie Street, for Bignells, Ltd.

Salop.—Infectious diseases accommodation, Prees Heath Sanatorium, and extensions, Monkmoor Hospital, for C.C.; county architect, 5, Belmont, Shrewsbury.

Scarborough.—Houses, Mount View Avenue, for Burkinshaw and Woodcock; G. H. Fawcett, architect, York Place, Scarborough.

Sedgefield. — Houses, East Howle; R.D.C. surveyor.

Sheffield.—Church and hall, Barnsley Road and Deerlands Avenue, for the Society of the Kelham Fathers.

Houses, Grimesthorpe Road; Fowler, Sandford & Potter, architects, 8, St. James Street.

Swimming bath, Western Bank; University of Sheffield.

Club premises, Gilpin Street; Samuel Smith (Tadcaster), Ltd.

Houses, Bramley Avenue; E. & H. Oliver.

Houses, Hemper Lane; R. Jones.

Public house, Shirecliffe estate; Tennant Bros., Ltd.

Springwell (Co. DURHAM).—Extensions to offices for A. Leybourne & Co., Ltd.; T. G. Price, builder, Springwell.

Staines.—Factory, George Street; T. Westhead (1938), Ltd., 18, Kingston Road.

Stirling.—Alterations, including rebuilding of left wing, Lennox Arms Hotel, Lennoxtown; C. Campbell.

Stockport.—Factory, North Reddish; Oswald McCardell & Co., Moss Park Road, Stretford.

Sunderland.—Extensions to Deptford Terrace school; education architect, 4, Tatham Street, Sunderland.

Rebuilding the Board Inn for the Tadcaster Tower Brewery Co., Ltd.

Thornley. — Bungalows; G. Ritchie, builder, Granville Terrace, Wheatley Hill.

Tiverton.—Extensions to Hospital; Joint Hospital Board.

Tow Law (Co. DURHAM).—Houses; U.D.C. surveyor.

Uckfield.—Houses, Marchants estate; R.D.C. surveyor.

Uxbridge.—Stores and offices, Park Road; Foyers, Ltd., wine merchants.

Wakefield.—Works extensions, Horbury Road; G. Senior.

Alterations and additions, Lupset Hotel, Horbury Road; Beverley Bros., Ltd.

Wallasey.—A.R.P. work at Town Hall (£3,500), and heating work, Mill Lane Hospital (£14,812), for T.C.; borough surveyor.

Wallsend.—Two garages, Tynemouth Road; Blayney & Co., Ltd.

Wareham.—Completion of Bere Regis and Wool housing schemes; R.D.C. surveyor.

Warrington.—Extensions to factory; Peter Stubs, Ltd., Scotland Road.

Watford.—Block of offices, High Street, for Abbey Road Building Society, Abbey House, Baker Street, N.W.1.

West Hartlepool.—Houses, Hart Lane; Watt Brothers, builders, 210, Park Road, West Hartlepool.

West Suffolk.—Decontamination and cleansing station, Newmarket, for C.C.; Architect's Department, Westgate House, Bury St. Edmunds.

Weymouth.—Police station, for Emergency Committee; borough surveyor.

Whittingham (NEAR PRESTON).—Additions to County Mental Hospital, for Lancs C.C.; T. Croft & Sons, Ltd., contractors, Holme Slack Works, Blackpool Road, Preston; electrical work.

Wilmslow.—Bus garage and offices, Swan Street; North Western Road Car Co., Ltd.

Worcestershire.—Senior school, Court Farm, Malvern; county architect, Worcester.